MR-J3-T

Servo Amplifier

Quick Start Manual

MR-J3-T Servo Amplifier With Point Table Positioning

(Point-to-Point Positioning)

Art. No.: xxxxxx
21122007
Version A

About This Manual

If you have any questions about programming or operating the equipment described in this manual please don't hesitate to contact your dealer or one of our official distributors (see back cover).

You can find up-to-date information and answers to frequently-asked questions on our website (www.mitsubishi-automation.com).

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Quick Start Manual
MR-J3-T Servo Amplifier with Integrated Point Table Positioning
Art. No.: xxxxxx

Version			Changes / Additions / Corrections
A	10/2007	pdp	First Edition

This Quick Start Manual for the servo amplifiers of the MR-J3-T series with point table positioning is designed to enable you to get your system installed and configured for use as quickly as possible. Please note that this guide only covers the basic functions with the instructions necessary to use these functions. Complete descriptions of all the supported functions and all available extensions can be found in the instruction manuals.

Please also note that the servo amplifiers of the MR-J3-T series include the following additional major functions that are not covered in this Quick Start Manual:

- Communication via a serial port for controlling point table positioning
- Positioning control in BCD format with the optional MR-DS60 digital switch
- Amplifier controller circuit settings and auto-tuning functions

Safety Instructions

To ensure safe and proper installation of the equipment please also observe the instructions and safety precautions in the instruction manuals supplied for your hardware.

Notes in this Quick Start Manual:

NOTE | Tips and useful information.

Additional documentation:

- MR-J3-T Instruction Manual (SH(NA030061-A)
- MR-J3-T Instruction Manual for CC-Link (SH(NA030058-B)
- Instruction Manual for the CC-Link Master Module:
  - QJ61BT11N
  - A1SJ61BT11
  - A1SJ61QBT11
  - FX2N-16CCL-M

Contents

1 Introduction

The servo amplifiers of the MR-J3-T series are designed specifically for drive positioning applications using point-to-point positioning without interpolation or trajectory control**.** The positions to be accessed stored in a table and can be selected cyclically, individually or in any order with:

- Digital signals
- CC-Link communication

The MR Configurator setup software package enables the user to test the entered positioning steps quickly and easily in test mode.

1.1 Preparations

The following products and parts are needed for using the point table positioning features described in this manual:

- A servo amplifier, for example **MR-J3-10T**
- A servo motor compatible with the selected amplifier
  Example: **HF-KP13** motor for the MR-J3-10T servo amplifier
- **MRZJW3-SETUP221E Version C0** of the MR Configurator setup software package
- **MR-J3USBCBL3M** USB cable for connecting your PC/notebook with the servo amplifier
- **MR-PWS1CBL M-A1-L** motor connection cable
- **MR-J3ENCBL M-A2-L** rotary encoder cable
- **MR-J2CMP2** connector for CN6 I/O signal connector
- Power supply cables conforming to the applicable installation regulations
- Connection cables for the control terminals

Required for positioning control with digital signals:

- **MR-J3CN1** connector for communication connector CN10
- Optional **MR-J3-D01** expansion card

Useful but not absolutely necessary:

- Simulation Box and terminal block with connection cable for testing:
  FX Simulation Box (Art. No. 3386)
  MR-TB50 terminal block for CN10 (MR-J3-D01)
  MR-J2M-CN1TBL•M cable for connecting CN10 to MR-TB50

Required for positioning control via a CC-Link network:

- Q-Rack with PLC and the CC-Link module **QJ61BT11N**
  or
  A–Rack with PLC and CC-Link module **A1SJ61BT11, A1SJ61QBT11** or **FX2N-16CCL-M**
- CC-Link cable compatible with version V1.10 Standard
- Cable for connecting the PC/notebook to the PLC CPU:
  Q series: SC-Q QC30R2
  A and FX series: SC-09
- The GX IEC Developer programming software package for configuration of the data communications settings

NOTE

This Quick Start Manual describes the installation and setup of a typical servo system consisting of an MR-J3-10T servo amplifier (single-phase, 230V / 100W) and an HF-KP13 servo motor. Note that the specifications of this sample system may differ from those of your configuration – please check your equipment's instruction manuals for details if necessary.

2 Installing the Equipment

The procedure for the physical installation of the MR-J3-T series hardware is exactly the same as for the MR-J3-A and MR-J3-B models. The dimensions of the MR-J3-T series amplifiers are identical to those of the matching models of the MR-J3-A and MR-J3-B series.

NOTE | Please consult the instruction manual for detailed installation instructions.

2.1 Installing the MR-J3-D01 Extension

Procedure:

① Remove the cover of the CN7 connector on the right side of the MR-J3-T housing.

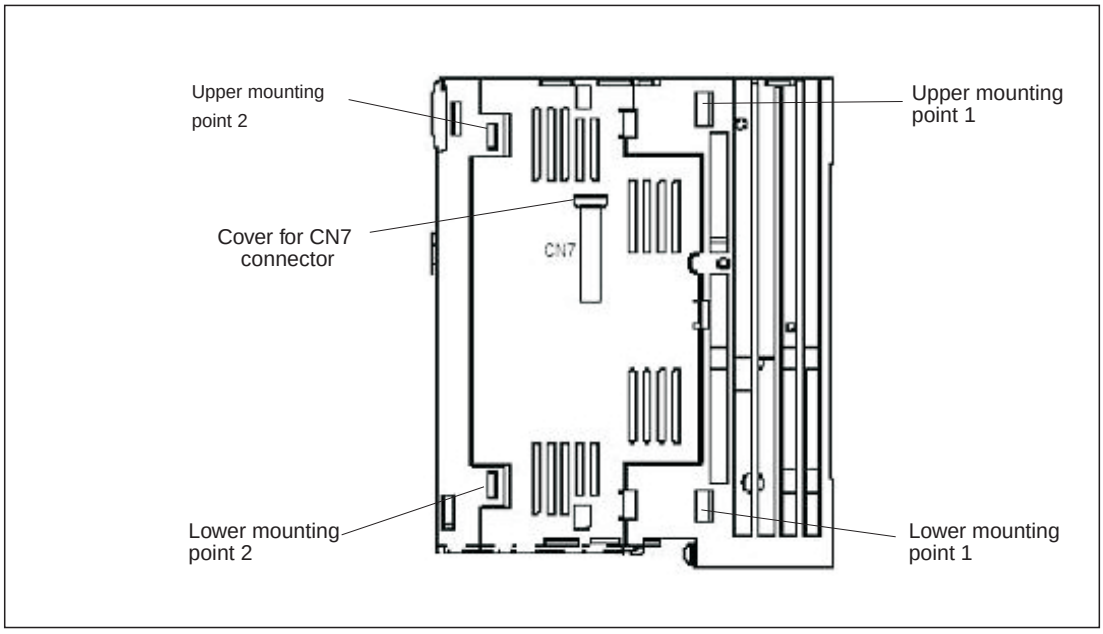


Fig. 2-1: *Fixing points of the extension MR-J3-D01*

② Position the MR-J3-D01 extension over the upper and lower mounting points 1 on the servo amplifier, then press the extension into place so that the lugs click into position in the upper and lower mounting points 2. This also connects the extension to the amplifier via connector CN7 on the amplifier.

③ Fasten the extension securely to the servo amplifier with the M4 screw (included) as shown in Fig. 2-2.

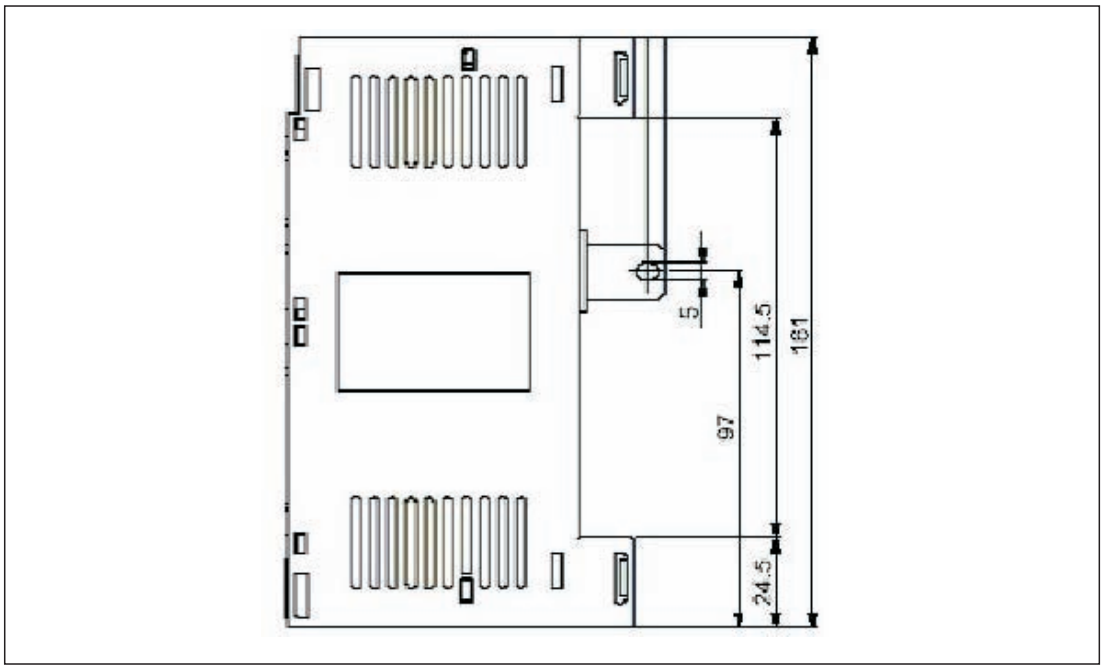


Fig. 2-2: *Fastening screw dimensions for extension MR-J3-D01*

NOTE

To uninstall the extension perform the above steps in the reverse order. To release the retaining clips press the retaining tabs marked “Push” inwards and pull the extension out to the side.

3 First Functional Test

The wiring diagram below (Fig. 3-1) shows the minimum connections that you must make to test an MR-J3-T series amplifier with the MR Configurator setup software. In test mode you can check whether all the components are working properly.

NOTE

You can also use the optional MR-PRU-03 HMI control terminal for performing initial tests and setting the amplifier's parameters. For further details see the MR-J3-T series instruction manual.

3.1 Minimum Connections for the Functional Check

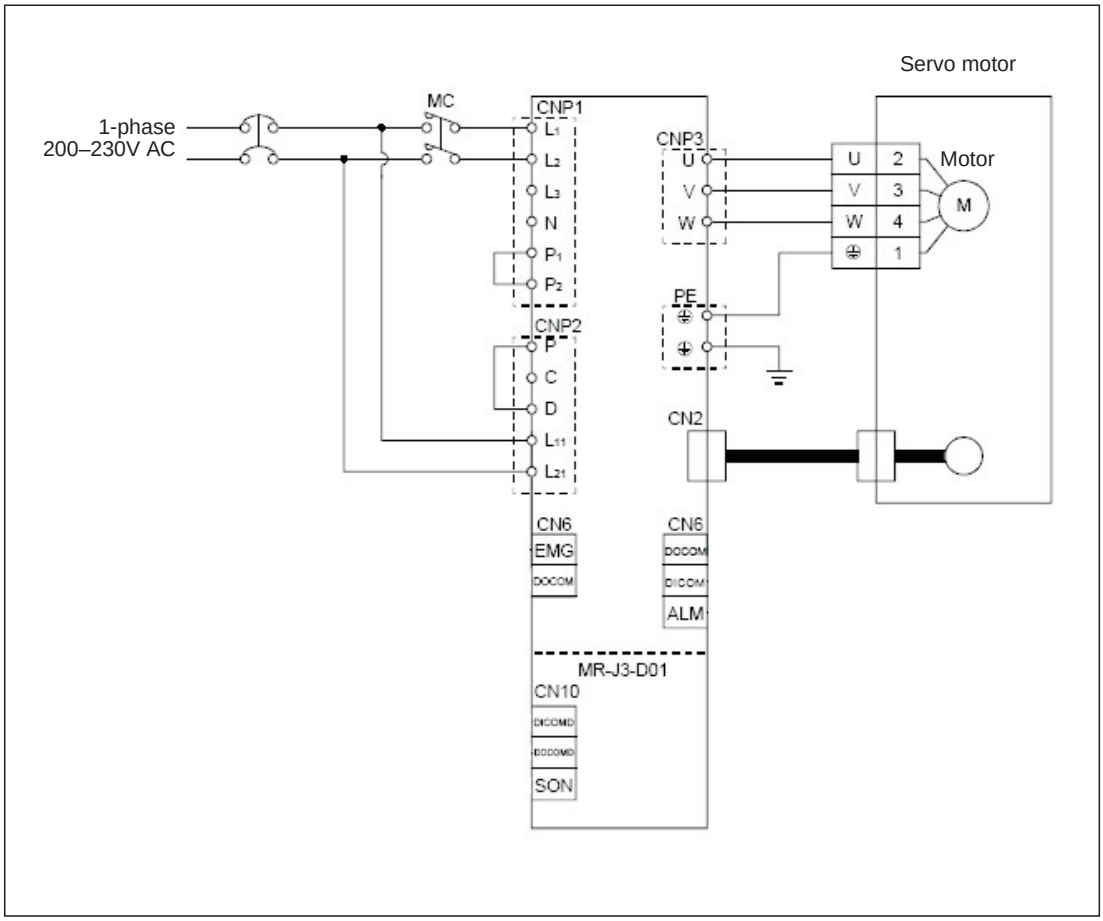


Fig. 3-1: *Wiring diagram for minimum configuration without control terminals*

3.1.1 Connector pin assignments

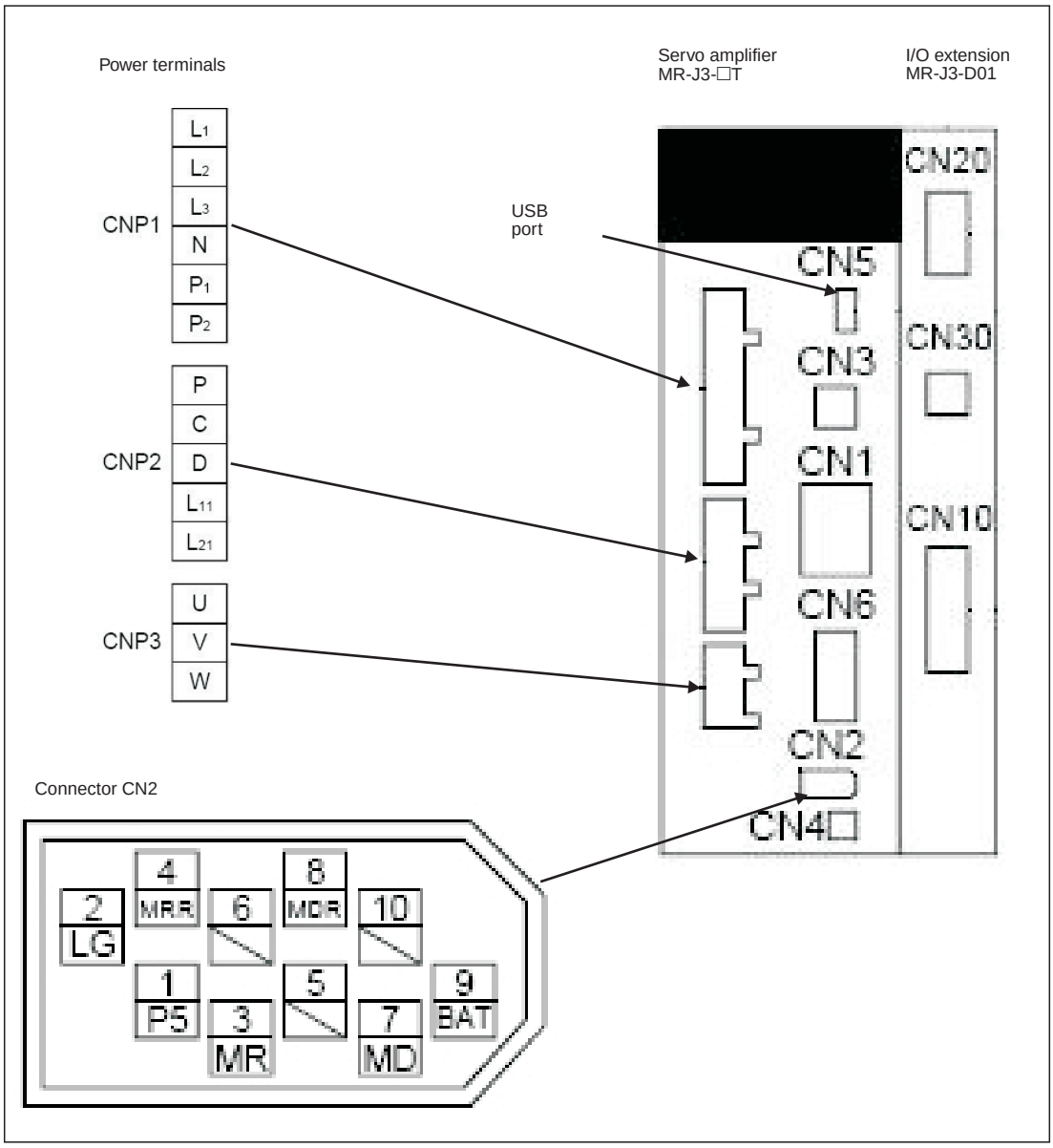


Fig. 3-2: *Power and control connector pin assignments for minimum configuration*

3.2 Functional Test Settings

The following input signals are required to activate the servo amplifier's motor output:

- EMG -> Force stop (safety signal)
- SON -> Servo ON
- LSP -> Forward rotation stroke end (limit switch)
- LSN -> Reverse rotation stroke end (limit switch)

You can configure the servo amplifier to activate these signals automatically when the power is switched on:

Procedure:

① Connect the PC / notebook to the servo amplifier's USB port (CN5) with the MR-J3USBCBL3M cable.

② Start MR Configurator on the computer and make the following settings:

– Select the MR-J3-T series servo amplifier:

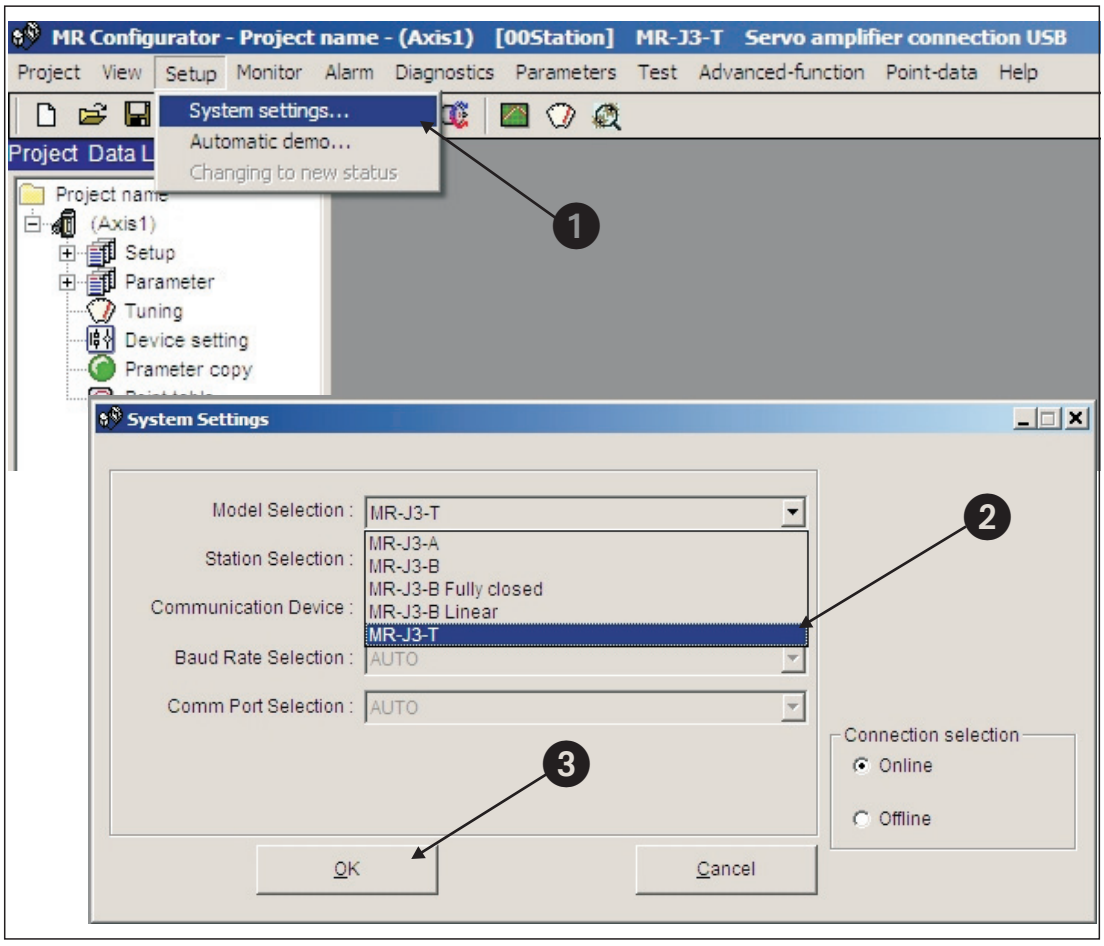


Fig. 3-3: *Selecting the servo amplifier*

– Set the parameter for the automatic activation of the EMG, SON and LSP/LSN input signals:

Parameter PD01 “Input signal automatic ON selection 1” = 1C04

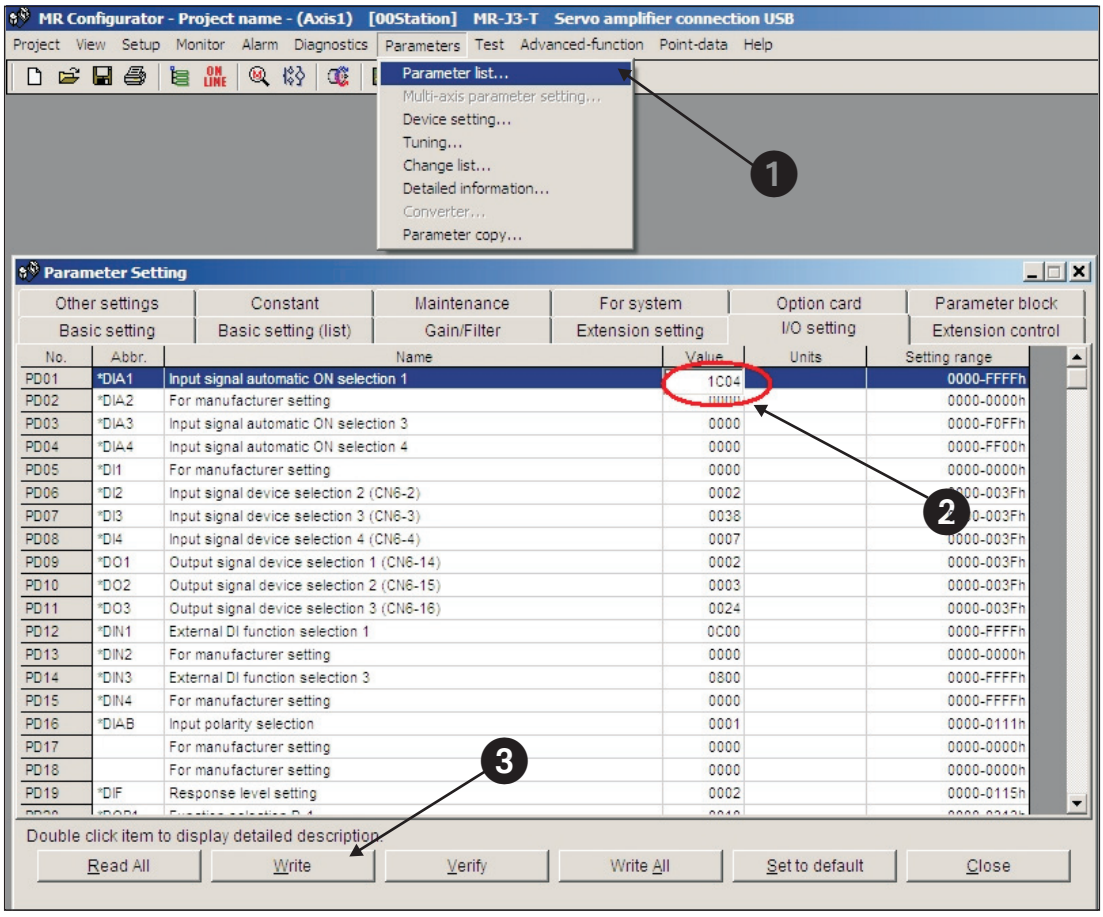


Fig. 3-4: *Parameter settings for automatic input signal activation.*

– Turn the servo amplifier off and then turn it on again to initialise the new parameter setting.

3.3 Configuring Positioning Point Tables

The position values, travel speeds and acceleration and deceleration times are stored in tables known as “point tables”. We will now go through the steps required to configure and define a point table.

Procedure:

① Select the *Point Table* option from the *Point-data* menu.

② Enter the values for the movements (position, speed, acceleration and deceleration times) in the *Point Table List* window, using one line for each movement:

- Enter target position **(a)** in µm x 10^{STM} (STM: e in diagram).
- Enter speed **(b)** in rpm.
- Enter acceleration/deceleration times **(c)** and **(d)** in ms as required for the motor’s rated speed.

③ Save the entries by clicking on the *Write All* button.

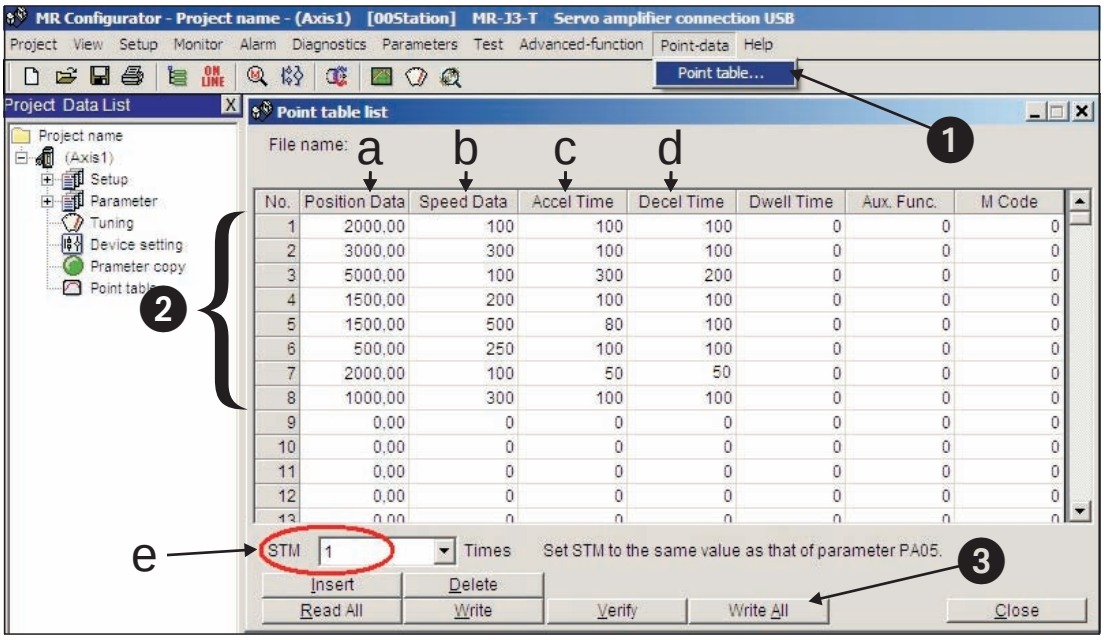


Fig. 3-5: *Point table positioning entries in the point table list window*

Make sure that the *Aux. Func.* value in every line is left at the default factory setting (“0”) to ensure that selecting a position value in the table does not inadvertently activate any subsequent table entries.

NOTES

In the factory default settings the absolute value command system for the target positions is activated with parameter PA01 “*STY”. When this system is active all target position values are referred to the physical home position. Alternatively you can also select the incremental value command system. The absolute position detection system for the home return function can be set with parameter PA03 “*ABS” (see chapter 4.3).

Loading the factory defaults will not overwrite your point table entries.

3.4 Functional Test with MR Configurator

Using MR Configurator you can perform a basic test of the individual positioning steps and make adjustments for your application. Note that setting parameter **PA14** does not have any effect on the rotation direction in **jog mode** when using MR Configurator. The rotation directions are defined as follows, looking at the end of the drive shaft (i.e. towards the motor):

- FORWARD -> anticlockwise
- REVERSE -> clockwise

NOTES

Home position return is not possible in test mode when using MR Configurator – use the **jog function** to move to the starting position.

You can set the rotation direction in “single-step feed mode” with parameter **PA14**.

3.4.1 Selecting point table position entries

Procedure:

① Select Single-step Feed ❶ in the *Test* menu.
② To select a position enter its point table line number in the dialog box displayed ❷.
③ Start the positioning operation ❸.

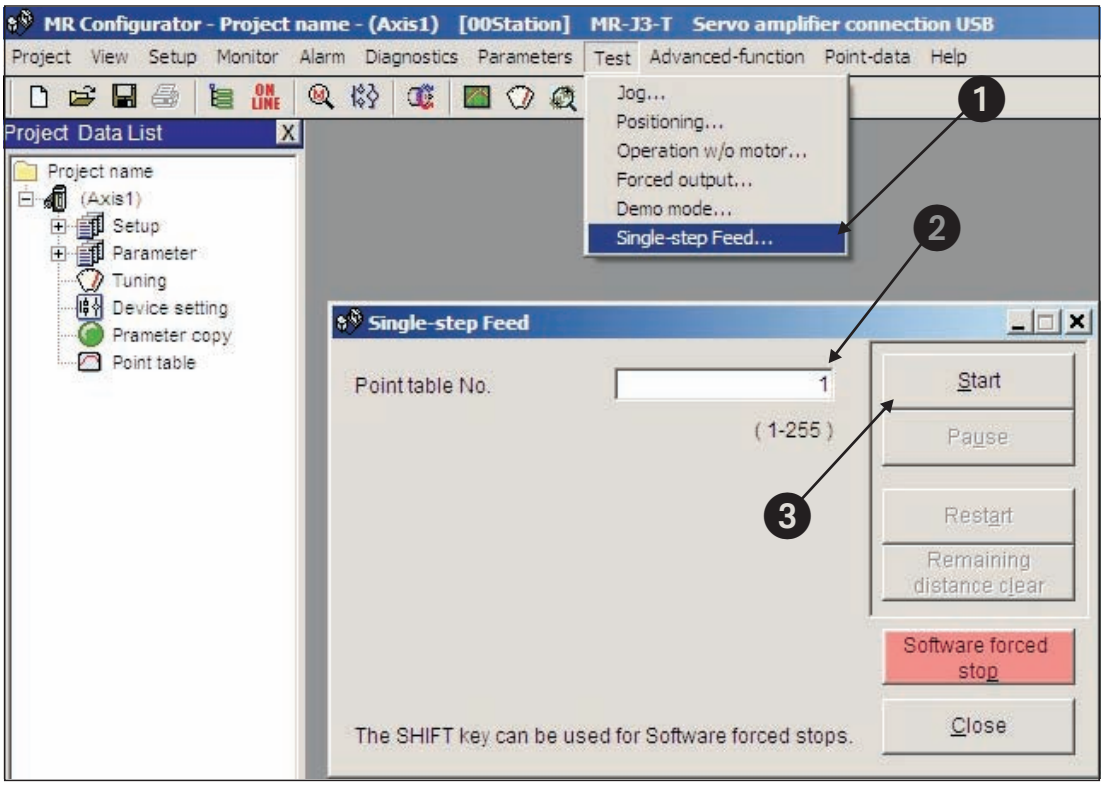


Fig. 3-6: *Single-step Feed window for testing individual positioning steps*

4 Positioning with Digital Inputs

This chapter describes how point table positioning is used in most applications with the MR-J3-T series amplifiers and the **MR-J3-D01** I/O extension.

NOTE Please refer to the instruction manual if you need other functions other than those described here for your application.

4.1 Additional Connections

The initial functional tests described in chapter 3.1 were performed with a minimum connection configuration. For the full range of standard functions you now need to make additional power supply and control terminal connections on the CN6 and CN10 terminal blocks, as shown below in Figs. 4-1 and 4-2.

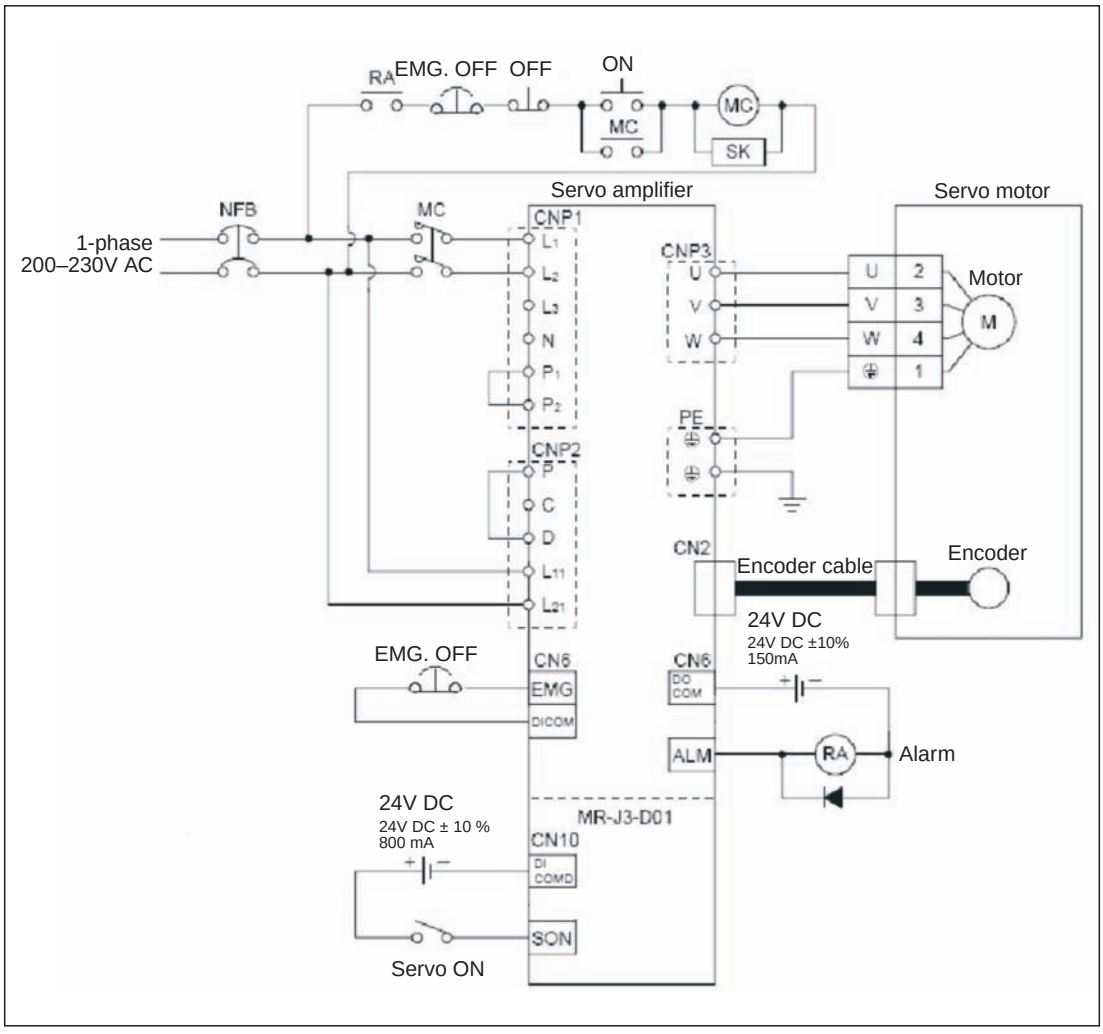


Fig. 4-1: *Single-phase power connections for the MR-J3-T amplifier*

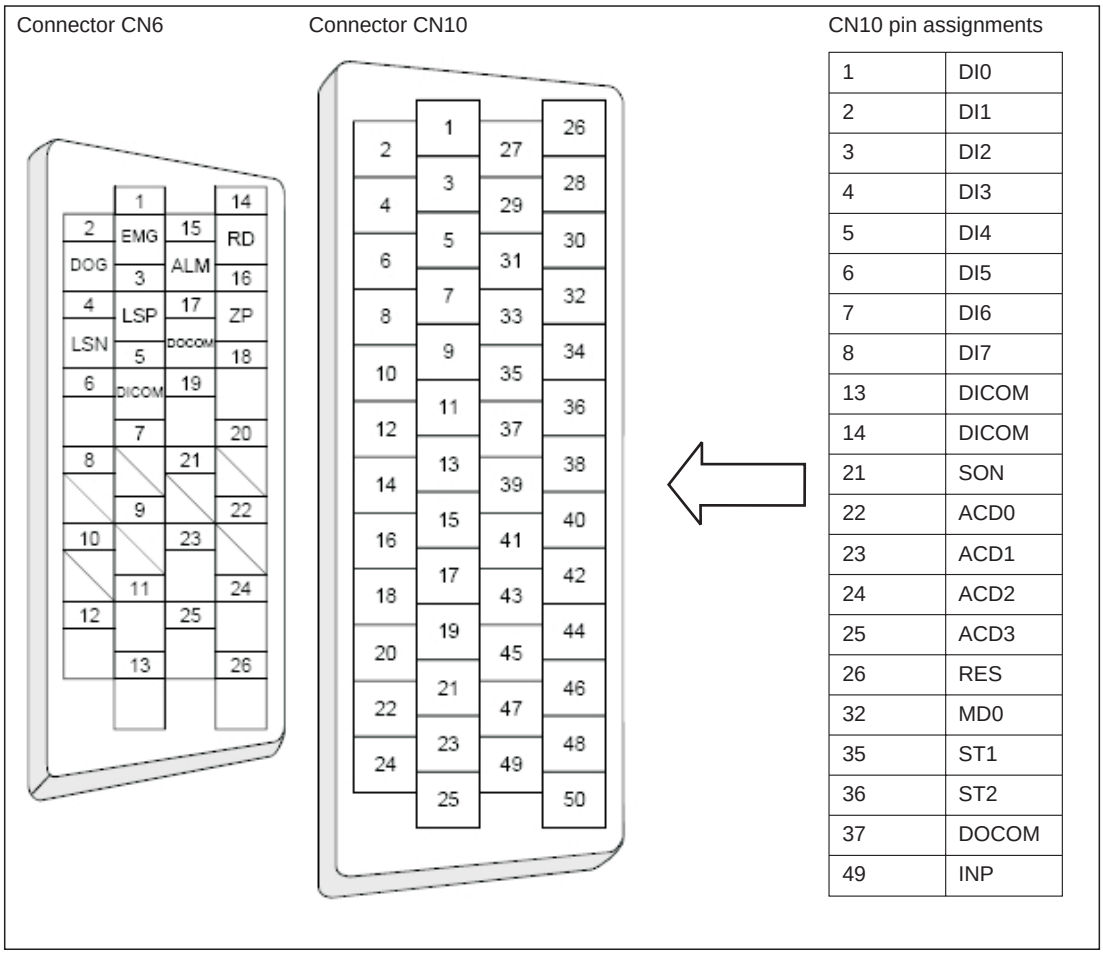


Fig. 4-2: *Pin assignments of connectors CN6 and CN10*

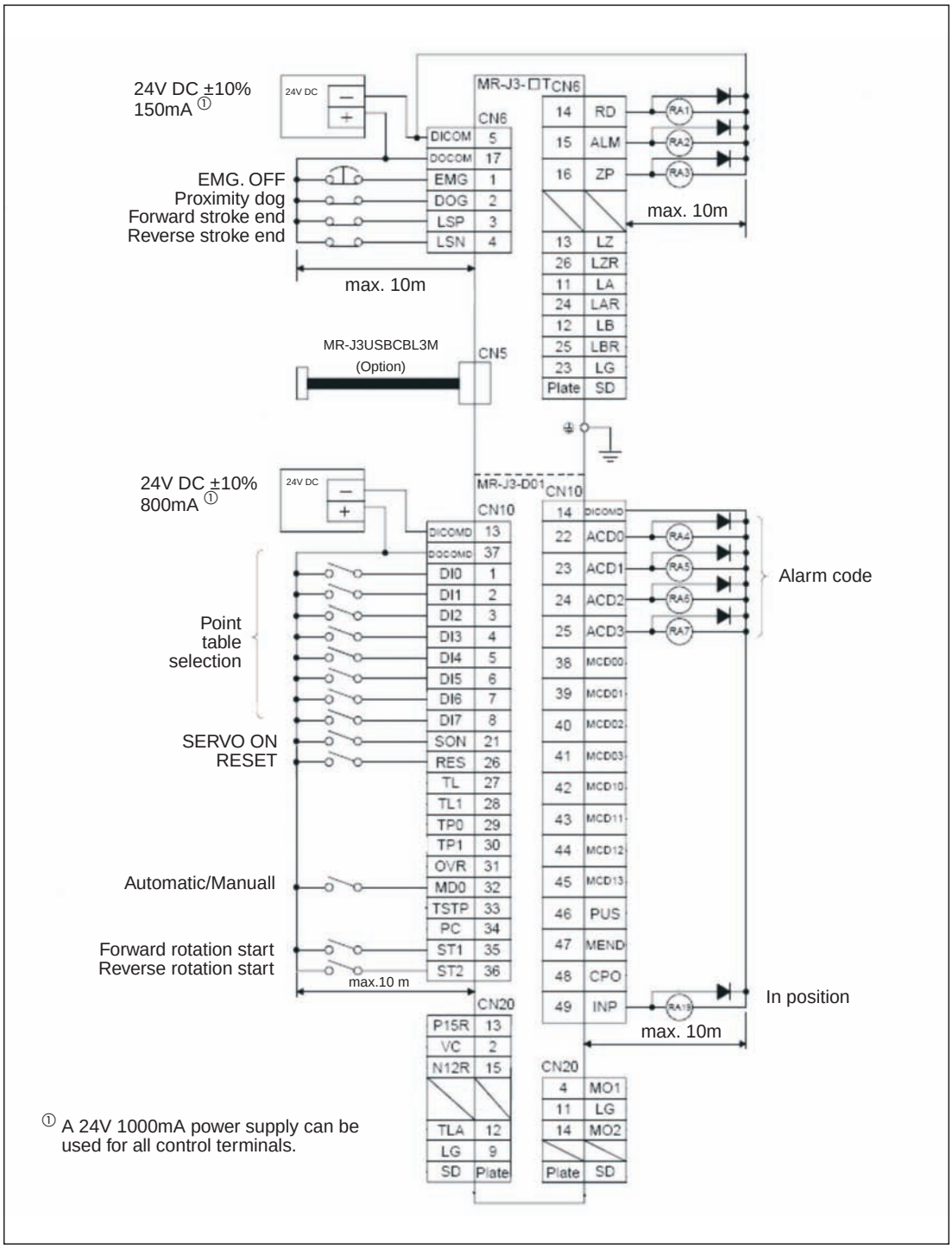


Fig. 4-3: *Connection of the control terminals with PNP logic (source logic)*

NOTES

You can find a brief descriptions of the signal functions in Appendix A.1. Please refer to the instruction manual for a complete reference.

All digital signals described in this manual use source logic.

For safety reasons the EMG signal must be connected to pin 1 of connector CN6 if the servo amplifier is not operated during the first functional test. The EMG signal is permanently assigned to pin 1 and the amplifier is deactivated when there is no EMG signal if it is configured accordingly (see chapter 3.2).

4.2 Turning off Automatic Input Signal Activation

Procedure:

① Reset parameter **PD01** to a value of "0":

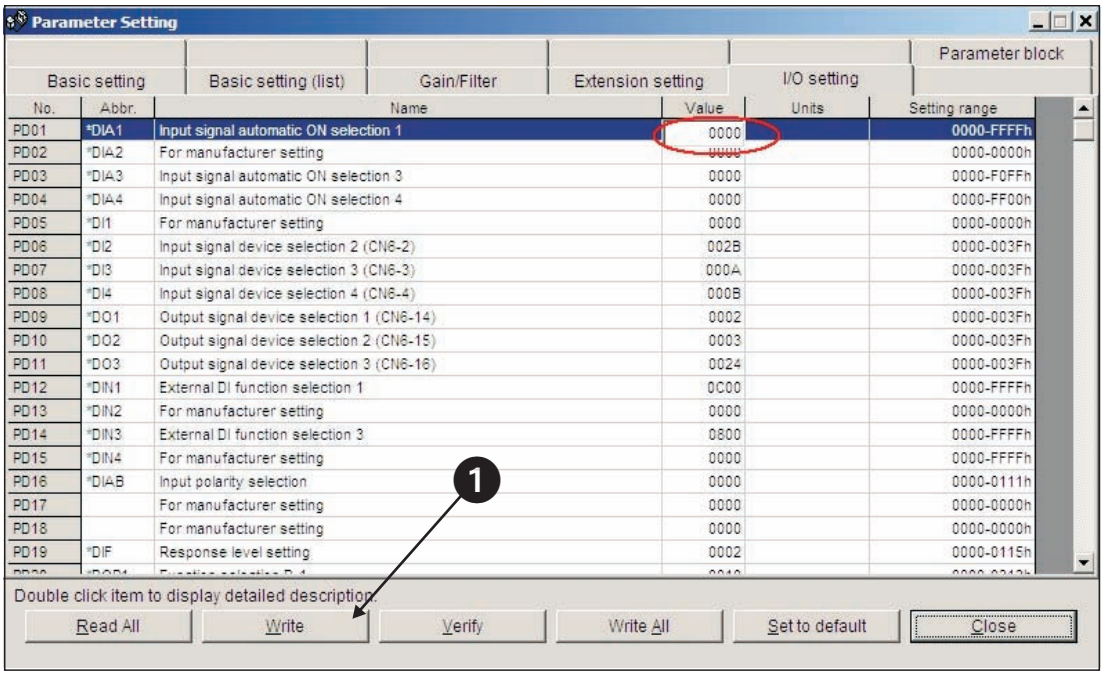
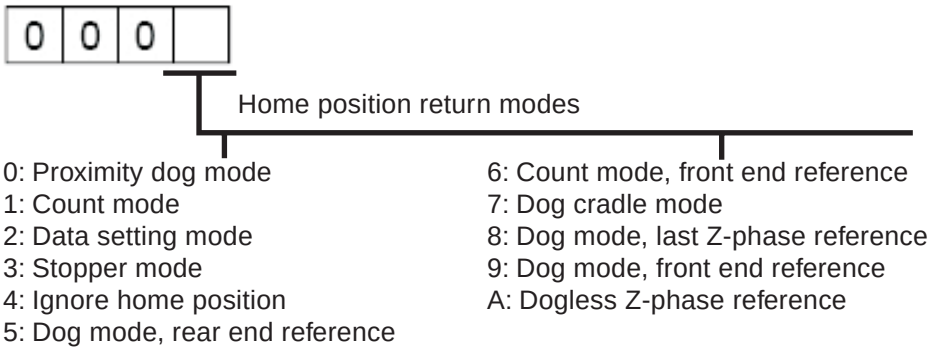


Fig. 4-4: *Switching off automatic input signal activation*

4.3 Home Position Return

At the factory the MR-J3-T servo amplifiers are configured with the incremental system activated by default (i.e. the absolute position detection system is switched off). This means that the current position is not stored when the amplifier's power supply is switched off, making it necessary to perform a return to home position every time the unit is powered up. You can configure the home position return mode with Parameter **PC02**:

Parameter PC02



The most commonly used modes are:

1. Dogless Z-phase reference mode (A)
2. Proximity dog mode (0)

These two modes are described in detail below. Dogless Z-phase reference mode is suitable for simple applications. Dog mode is frequently used for standard applications.

4.3.1 Dogless Z-phase reference mode

In this mode the Z-phase of the rotary encoder (zero position of the encoder) is used as the machine's physical home position. However, it is quite rare to be able to configure a machine so that its physical home position exactly matches the Z-phase of the encoder. It is thus almost always necessary to enter an offset (shift) with parameter **PC06**.

After activation of the forward start command ST1 (or reverse ST2) the home position return is initiated by parameter **PC04** (“home position return speed”). When the Z-phase signal from the encoder is registered the servo motor brakes to a halt. After this a precise return to home is performed at creep speed with parameter **PC05**.

The physical home position can be shifted in relation to the zero position of the encoder (Z-phase) with the home position offset (shift) defined with parameter **PC06**. Parameter **PC07** can be used to define a home position value other than zero.

When the home position return has been completed successfully the servo amplifier activates the ZP signal.

Timing chart:

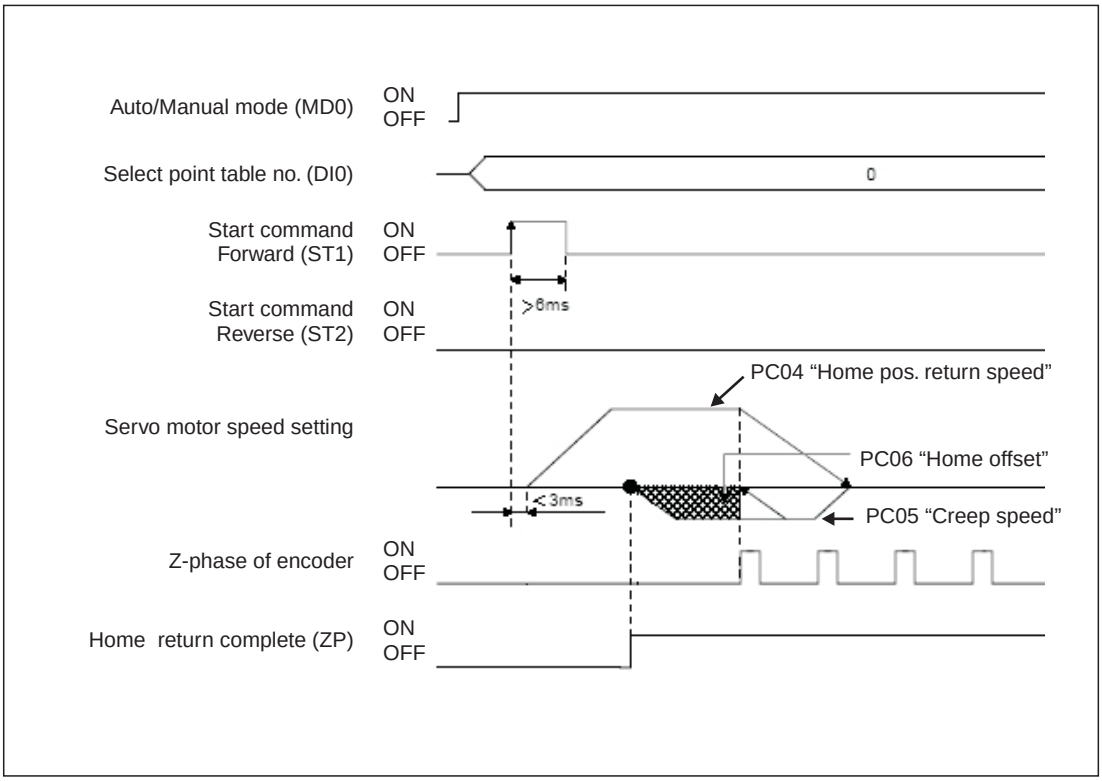


Fig. 4-5: *Home position return sequence in dogless Z-phase reference mode*

No.	Code	Function	Description
PA05 ①	*FTY	Feed length multiplication factor	Needed here to scale the home position value to the physical coordinate system.
PC02 ①	*ZTY	Home position return mode	Selects the home position return mode: A: Dogless Z-phase reference mode
PC03 ①	*ZDIR	Home position return direction	0: Incrementing counting of encoder pulses 1: Decrementing counting of encoder pulses
PC04	ZRF	Home position return speed	Sets home position return speed until first detection of the Z-phase in [rpm].
PC05	CRF	Creep speed	Speed for precise movement to home position in [rpm].
PC06	ZST	Home position offset (shift)	Distance between the encoder zero point (Z-phase) and the physical home position in [µm].
PC07 ①	*ZPS	Home position return position value	The home position return stops when the Z-phase position is reached.You can enter a non-zero coordinate for this position [in 10^{STM}µm] with this parameter.

Table 4-1: *Parameter reference table*

① You must turn the power off and on again to activate this parameter.

Examples:

① The Z-phase of the encoder is defined as the physical home position of the machine. In this example we are going to perform the home position return at 200 rpm in the direction in which the encoder pulses are counted incrementally.

Parameter settings:

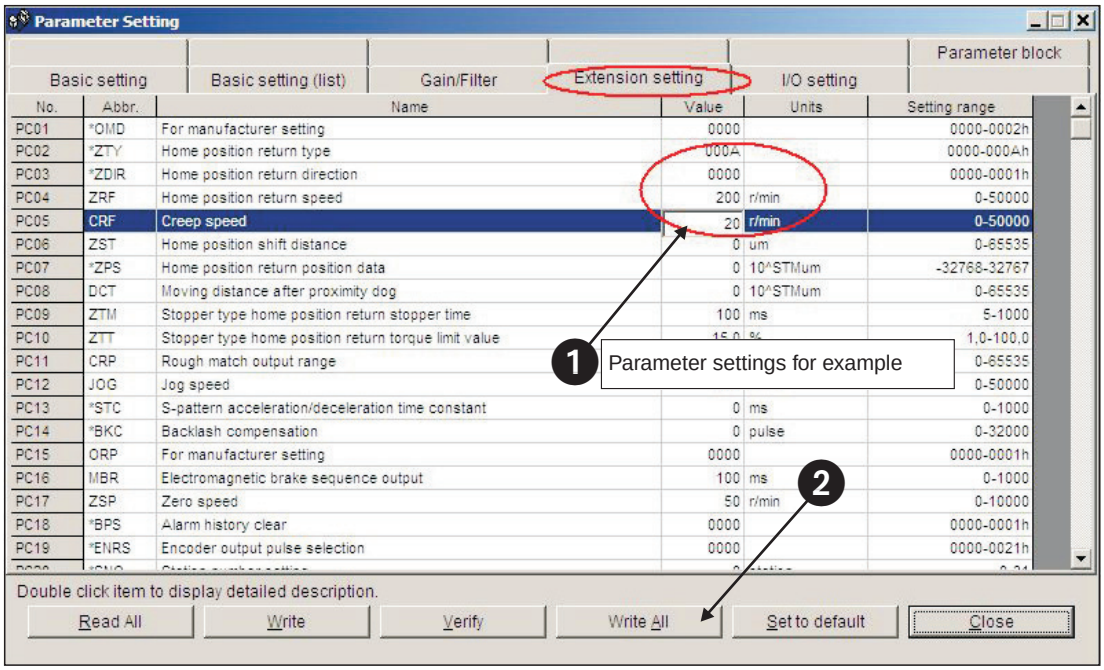


Fig. 4-6: *Relevant parameter settings for example 1*

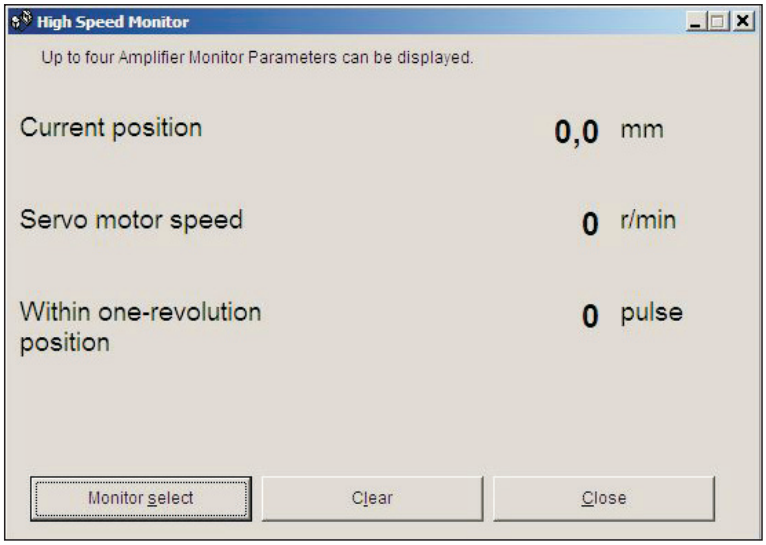


Fig. 4-7: *Values shown when the home position return has been completed correctly*

② Perform a home position return as in example 1 but with an offset between the physical and encoder home positions, set with parameter PC06.

Parameter settings:

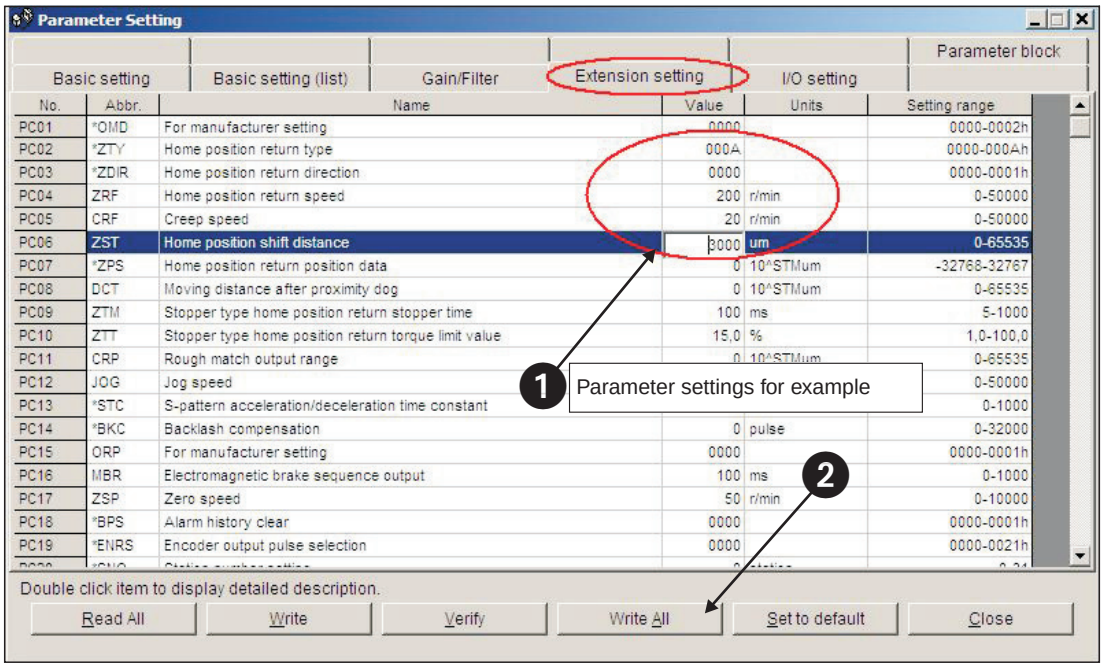


Fig. 4-8: *Relevant parameter settings for example 2. The offset is entered with parameter PC06.*

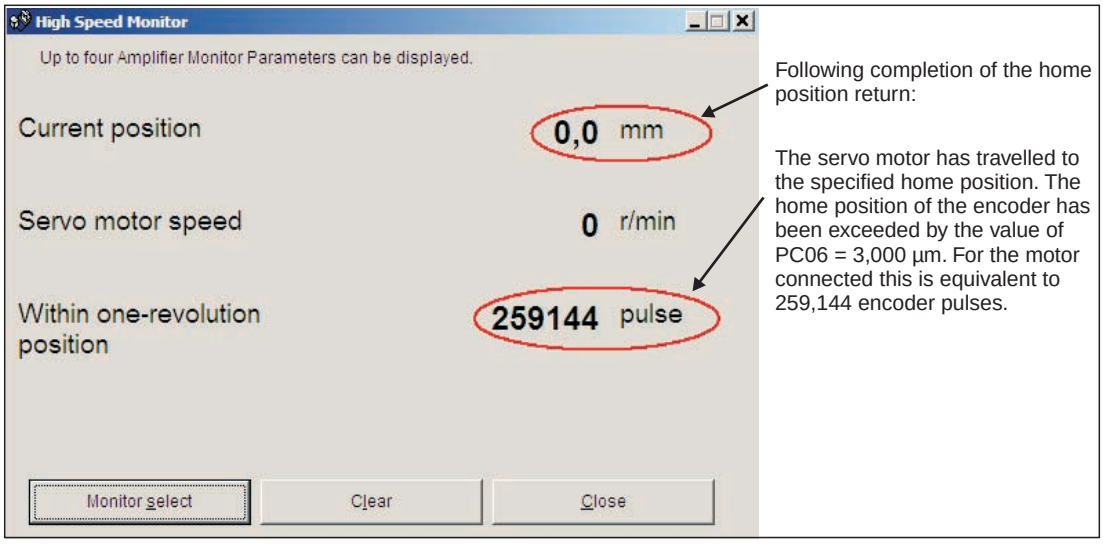


Fig. 4-9: *Values shown when the home position return has been completed correctly*

4.3.2 Dog mode home position return

In this mode, instead of the encoder Z-phase(Fig. 4-6), the DOG signal is used to switch from "home position return speed" **PC04** to "creep speed" **PC05**. You can use parameter **PD16** "proximity dog detection polarity" to specify whether a logical "1" or a logical "0" should be identified as an active DOG signal.

As in ① above, the physical home position can be shifted in relation to the home (zero) position of the encoder (Z-phase) with **PC06** "home position offset (shift)". In addition to this you can also set a non-zero coordinate for the home position with **PC07**.

Conditions for the proximity dog signal:

The proximity dog signal (DOG) must fulfill the following conditions to ensure that the Z-phase of the encoder is detected during the activation period of the DOG signal:

$$L_1 \geqslant \frac{V}{60} \bullet \frac{t_d}{2}$$

L1 = Length of the DOG signal in [mm]
V = Home position return speed in [mm/min]
t_d = Deceleration time in [s]

$$L_2 \geqslant 2 \bullet \Delta S$$

L2 = Length of the DOG signal in [mm]
ΔS = Distance for one rotation of the motor in [mm]

Timing chart:

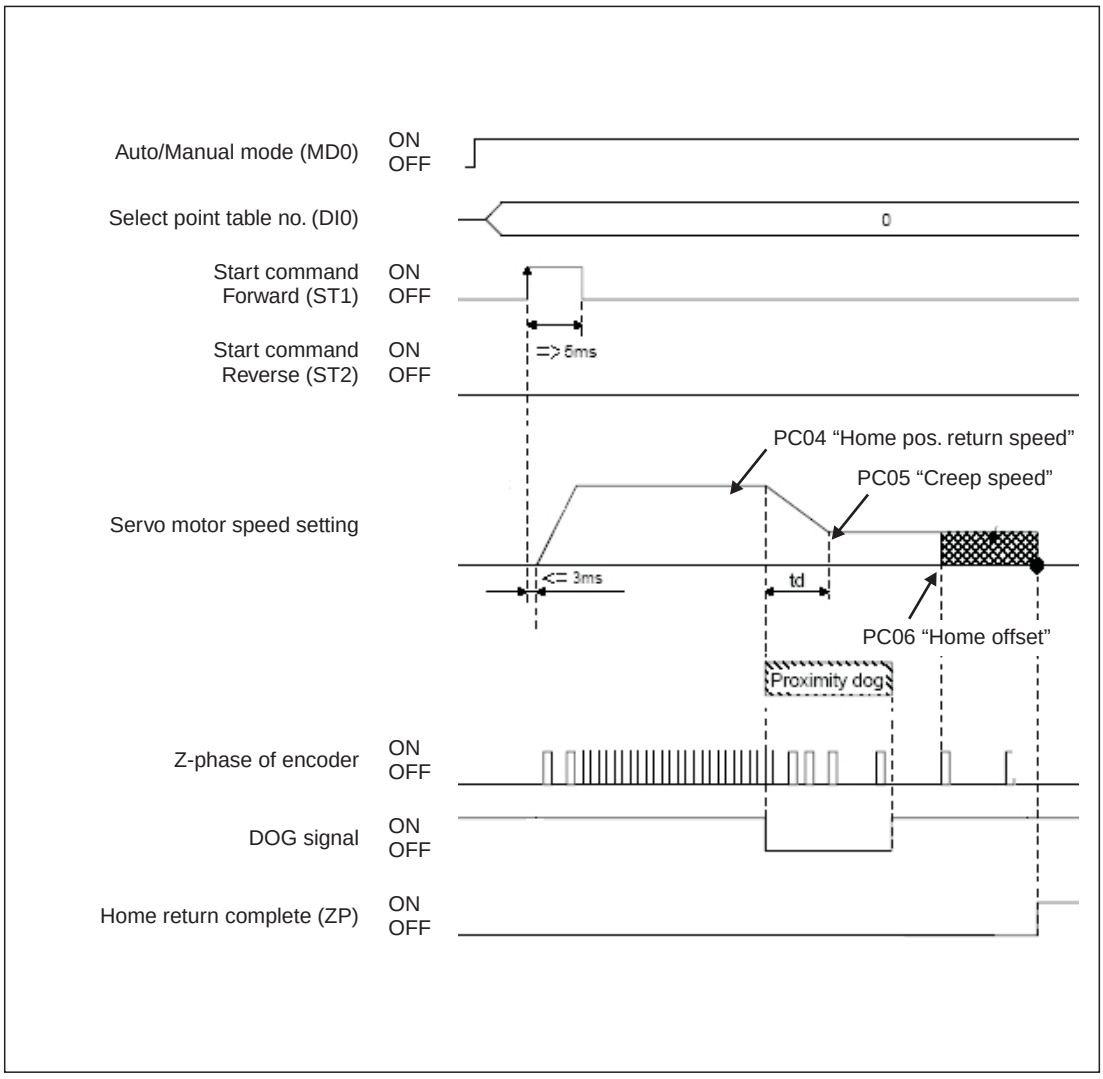


Fig. 4-10: *Home position return in proximity dog mode*

<table>
<tr><th>No.</th><th>Code</th><th>Function</th><th>Description</th></tr>
<tr><td>PA05 ①</td><td>*FTY</td><td>Feed length multiplication factor</td><td>Needed here to scale the home position value to the physical coordinate system when a home position offset (shift) has been set.
<table>
<tr><td>Parameter value</td><td>Multiplication factor STM</td></tr>
<tr><td>0</td><td>1</td></tr>
<tr><td>1</td><td>10</td></tr>
<tr><td>2</td><td>100</td></tr>
<tr><td>3</td><td>1000</td></tr>
</table></td></tr>
<tr><td>PC02 ①</td><td>*ZTY</td><td>Home position return mode</td><td>Selects the home position return mode:
0: Proximity dog mode (DOG)</td></tr>
<tr><td>PC03 ①</td><td>*ZDIR</td><td>Home position return direction</td><td>0: Incrementing counting of encoder pulses
1: Decrementing counting of encoder pulses</td></tr>
<tr><td>PC04</td><td>ZRF</td><td>Home position return speed</td><td>Sets home position return speed until first detection of the Z-phase in [rpm].</td></tr>
<tr><td>PC05</td><td>CRF</td><td>Creep speed</td><td>Speed for precise movement to home position in [rpm]</td></tr>
<tr><td>PC06</td><td>ZST</td><td>Home position offset (shift)</td><td>Distance between the encoder home position (Z-phase) and the physical home position in [µm]. Does not change the zero point of the physical coordinate system.</td></tr>
<tr><td>PC07 ①</td><td>*ZPS</td><td>Home position return position value</td><td>The home position return stops when the Z-phase position is reached.You can enter a non-zero coordinate for this position [in 10^{STM}µm] with this parameter.</td></tr>
<tr><td>PD16 ①</td><td>*DIAB</td><td>Input signal polarity</td><td>Logical value for detection of the proximity dog signal (DOG):
0: Active DOG on logical "0"
1: Active DOG on logical "1"</td></tr>
</table>

Table 4-2: *Parameter reference table*

① You must turn the power off and on again to activate this parameter.

Example:

In the following example the physical home position is at the position of the Z-phase of the encoder. However, we now want to assign a non-zero value in the physical coordinate system to this position.

Parameter settings:

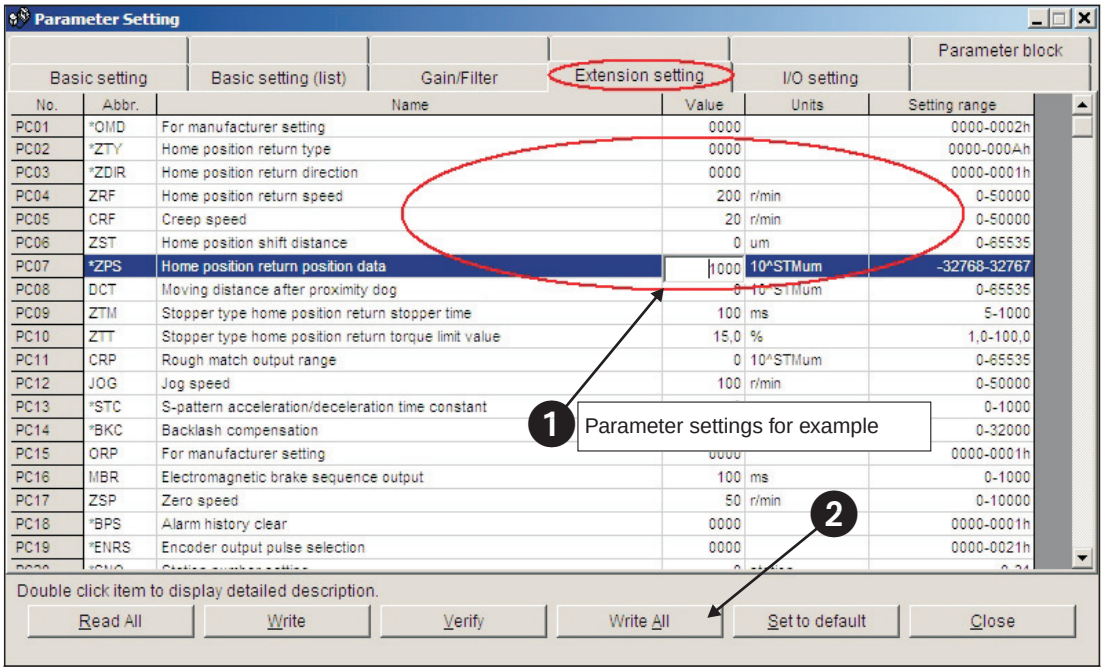


Fig. 4-11: *Relevant parameter settings for the example. The home position value is entered with PC07.*

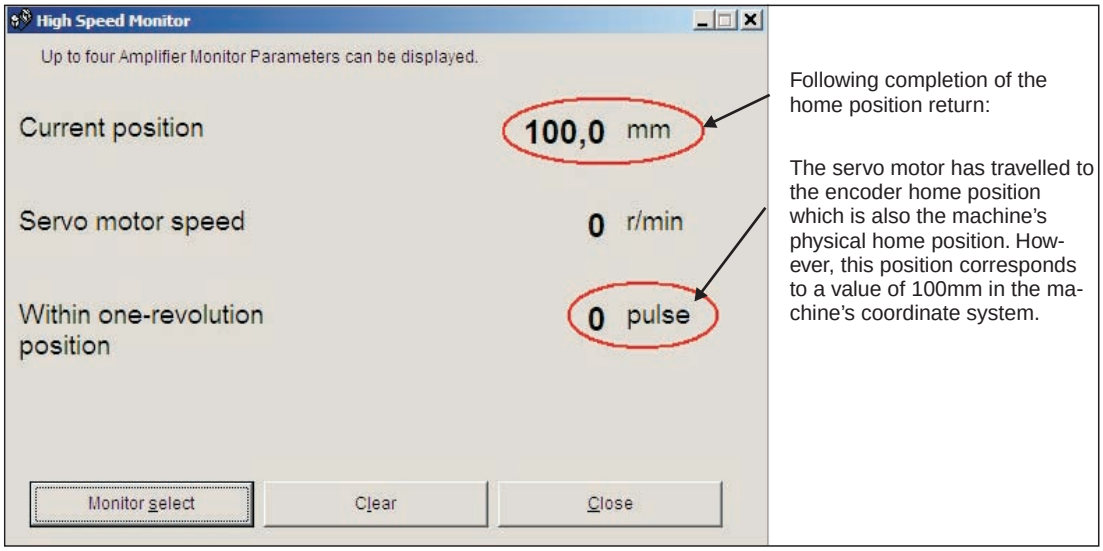


Fig. 4-12: *Values shown when the home position return has been completed correctly*

The position value is calculated as follows:

X = PA05 • PC07 in [mm]

In the above example with PA05 = 1 and PC07 = 1000 [10^{STM} µm] this gives us:

X = 1000 • 10^{1} µm

4.4 Configuration for Positioning

If you install the MR-J3-D01 I/O expansion you can use point table positioning, which allows you to select positions from a list of up to 256 table entries with a combination of eight digital inputs. Table 4-3 shows how binary input signals are encoded to address the point table entries.

Digital Input Signals								Selected Point Table Entry
DI7	DI6	DI5	DI4	DI3	DI2	DI1	DI0	
0	0	0	0	0	0	0	1	1
0	0	0	0	0	0	1	0	2
0	0	0	0	0	0	1	1	3
0	0	0	0	0	1	0	0	4
. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
1	1	1	1	1	1	1	0	254
1	1	1	1	1	1	1	1	255

Table 4-3: *Selection of point table entries with digital input signals*

In the factory default configuration the incremental system is activated, which means that the absolute position detection system is turned off (**PA03** “absolute position detection system”).In this mode the current position is not stored when the power is turned off and you must thus perform a home position return every time the amplifier is powered on. The default configuration also uses absolute target positions (**PA01** “positioning control mode”).

No.	Code	Function	Description
PA01 ①	*STY	Positioning control mode	0: Absolute target position values 1: Incremental target position values
PA03 ①	*ABS	Absolute position detection system	0: Incremental system (absolute detection off) 1: Absolute position detection system on
PA05 ①	*FTY	Feed length multiplication factor	Needed here to scale the home position value to the physical coordinate system when a home position offset (shift) has been set.

Parameter value	Multiplication factor STM	Range of the target position values
0	1	–999.999 .. +999.999
1	10	–9999.99 .. +9999.99
2	100	–99999.9 .. +99999.9
3	1000	–999999 .. +999999

Table 4-4: *Parameter reference*

① To activate this parameter you must switch the amplifier power off and on again.

The following example shows some typical configuration settings used for many common positioning applications:

Procedure:

① Select the incremental system for positions with **PA03 *ABS**.
② Select absolute value command mode for target positions with **PA01 *STY**.
③ Set a multiplication factor with **PA05 *FTY = 1 => 10 times factor.**

This gives us the following position system:

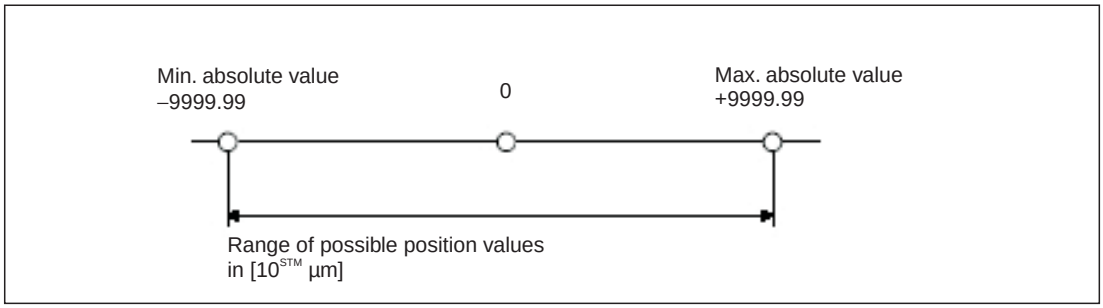


Fig. 4-13: *Effective range of the position values with the sample settings*

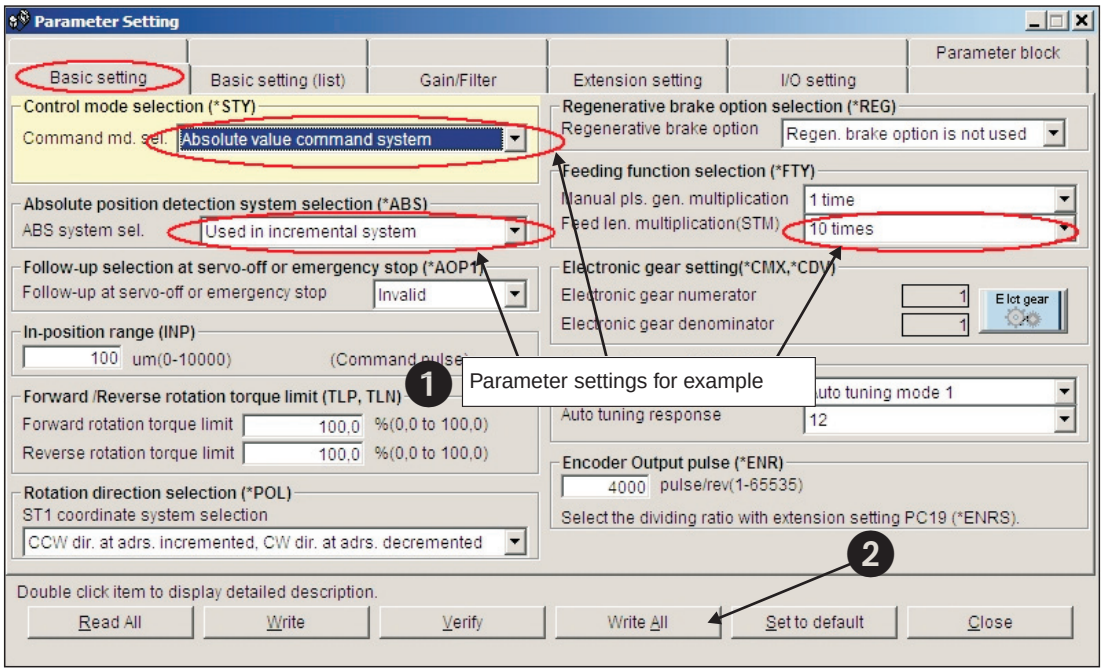


Fig. 4-14: *Relevant parameters affecting the target position setpoint values*

NOTE

If target positions are entered using the incremental system it is not possible to change the rotation direction via the point table. In this mode the rotation direction can only be changed with the start commands (ST1/ST2).

④ The point table entries for the individual positioning steps are configured in the columns numbered ❶ to ❹ in the point table list shown below.

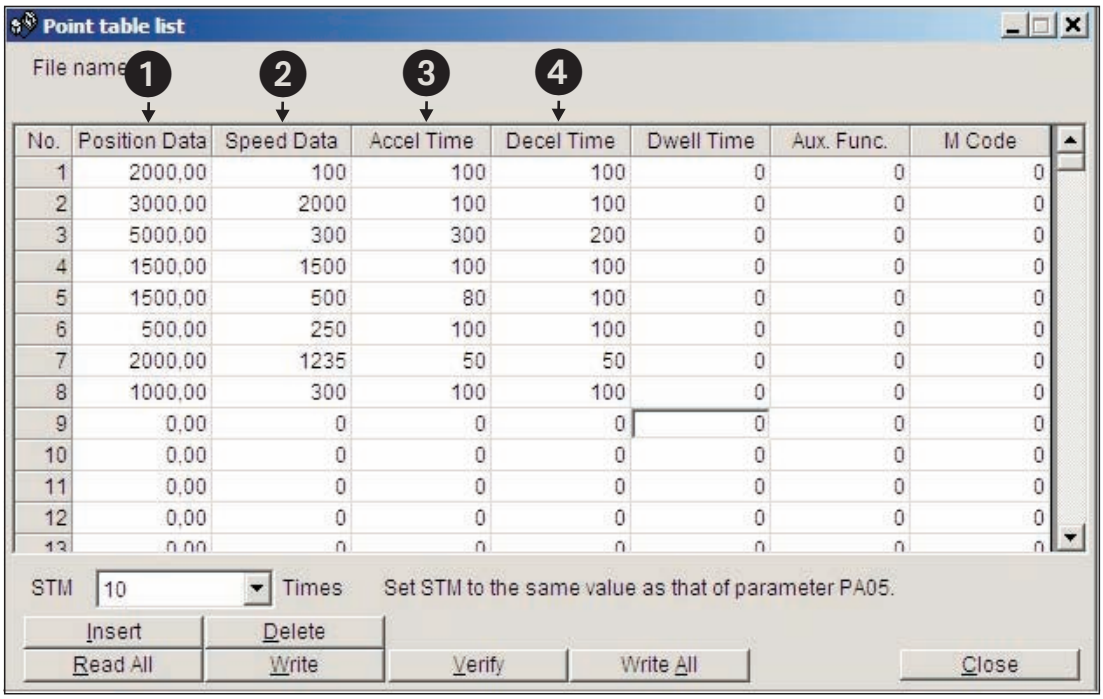
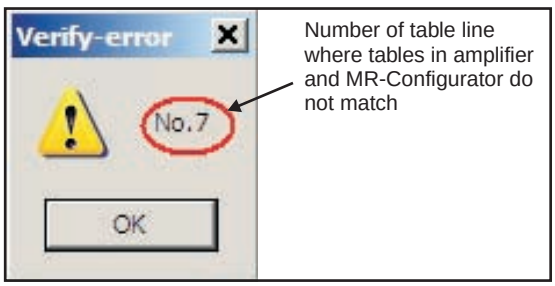


Fig. 4-15: *Example of a positioning application with 8 positioning steps*

Tips for editing point table entries:

- The value in the *Aux. Func.* column should normally always be zero. Otherwise the system will automatically jump to the next entry in the table and execute the next positioning command after completing a positioning step, even if there is no change in the input signals.
- The *Dwell Time* column can be used to insert a delay between reaching the target position of the positioning step for the current table line and continuing to the next table line. This option should only be used when multiple positioning steps are performed automatically, without changes in the input signals.
- The button *Insert* inserts a new line above the selected table line. *Delete* deletes the selected line.
- The Verify function checks whether the positioning table in MR Configurator matches the table stored in the connected servo amplifier. If the tables don't match a message is displayed showing the line number where the difference was found:



- Always deactivate start command ST1/ST2 before starting a new positioning sequence. Then you can select a new table entry with DI0 - DI7 and start the positioning sequence with ST1/ST2.
- Table entries are not reset when you restore the amplifier's factory default settings!
- You do not need to turn the amplifier off and on again after changing table entries.

NOTE | Please see the instruction manual for full details on all these procedures.

4.4.1 Importing and exporting point tables

There are two different ways to store the point table from your project so that you can edit it again later in external programs and MR Configurator:

- Export the point table as a text file with the extension **.ptb**. This creates a plain text file that can be edited with a normal text editor.
- Export the point table as a file with the extension **.csv**. These files contain data that can be edited by spreadsheet programs like Microsoft Excel.

Procedure:

① The Point Table List window must be open and active.
② How to export the point table to a file:

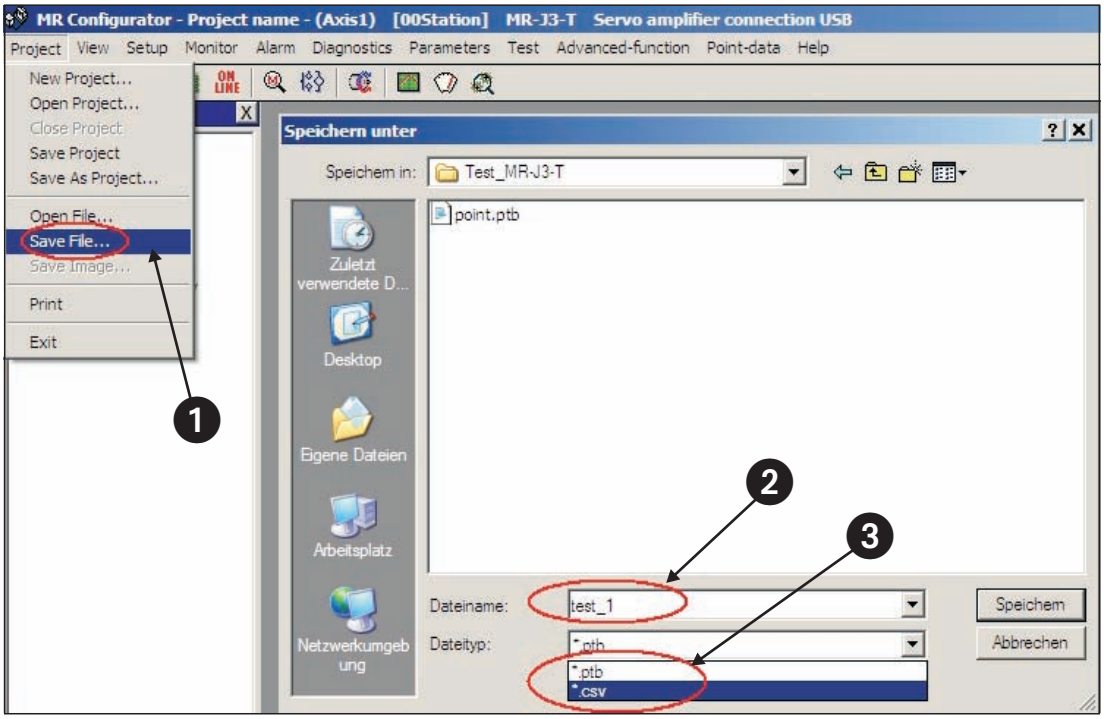


Fig. 4-16: *Exporting the point table to a file for archival or editing*

③ How to open/import a point table data file:

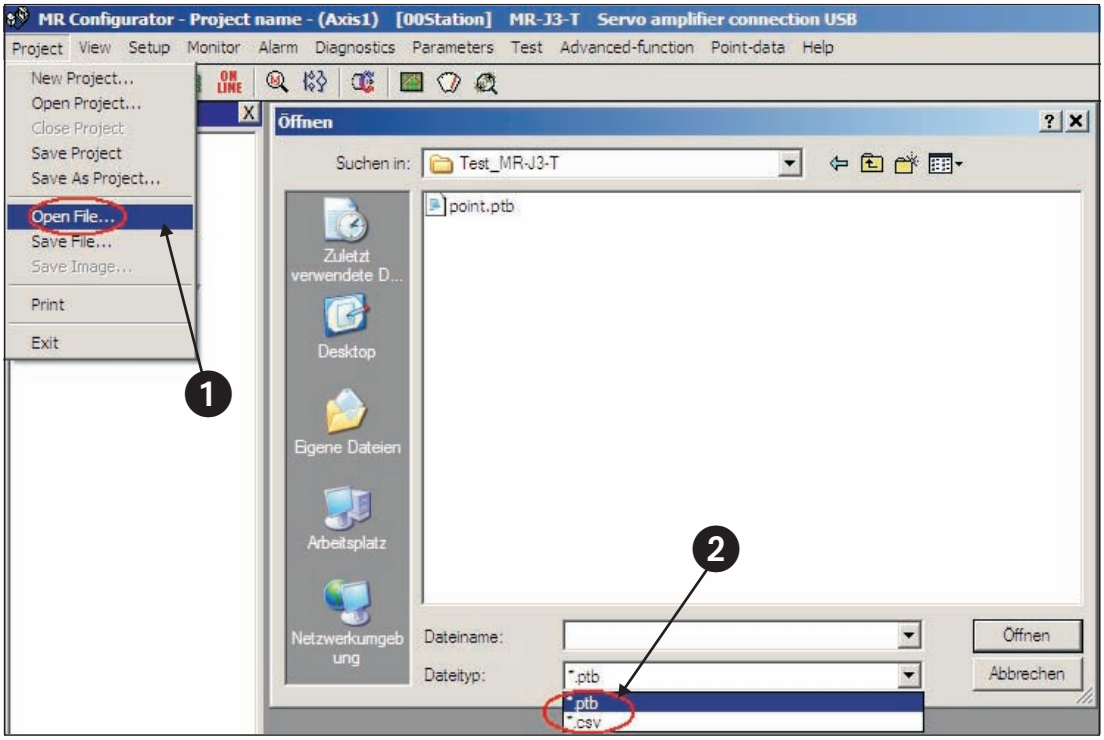


Fig. 4-17: *Opening a point table file to import the data*

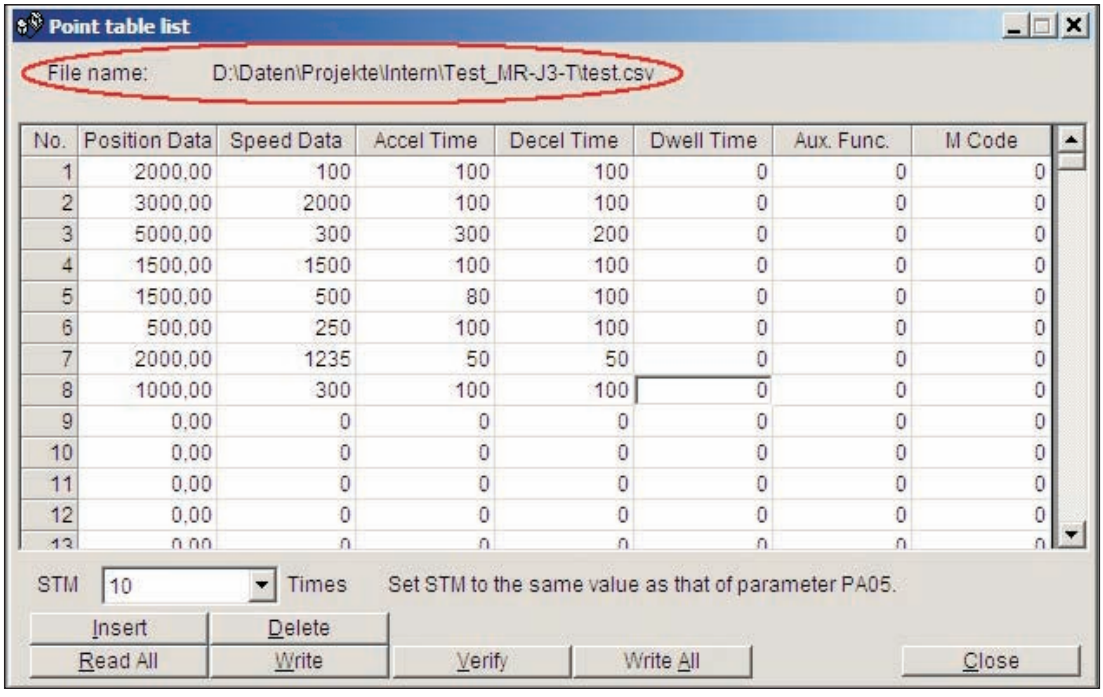


Fig. 4-18: *Point table position data imported from a .csv file*

4.5 Functional Test of Digital Input Positioning

Normally you need a simple controller to set the digital inputs used to select the point table position entries, for example a PC, a mini PLC or an HMI control terminal. This chapter explains how you can perform a thorough check of the functionality of the positioning control functions without needing to perform the additional work of programming and installing a controller.

Fig. 4-19 shows a test installation without an external controller. Note that the FX Simulation Box used in this setup can set a maximum of 14 digital inputs.

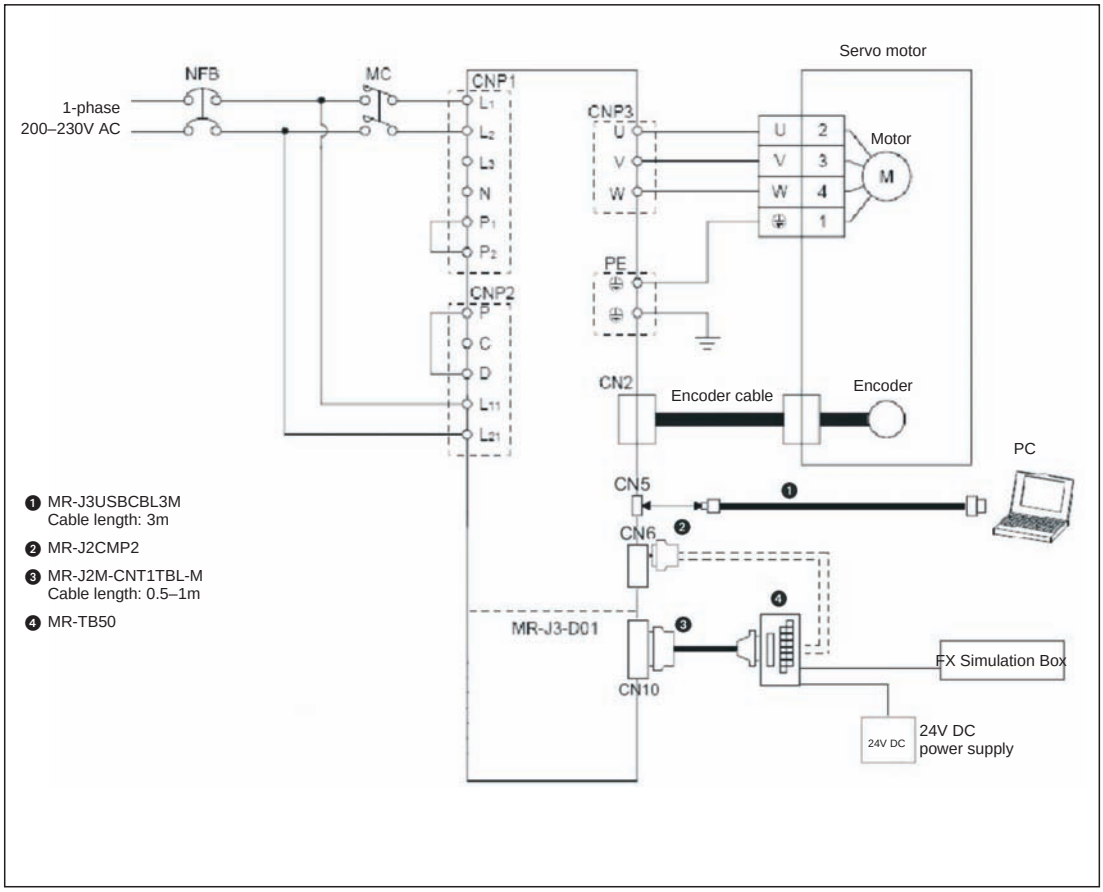


Fig. 4-19: *Test setup for simulating positioning with digital inputs*

NOTE

The test setup shown above does not use any safety features for the tests (EMG. OFF). You should thus only use this setup in a controlled test environment where errors cannot cause any danger for personnel or equipment!

MR Configurator can monitor all the inputs and outputs of the MR-J3-T, including those on the MR-J3-D01 I/O extension.

Procedure:

① Connect the PC/notebook to the USB port (CN5) of the servo amplifier using cable MR-J3USBCBL3M.

② Start MR Configurator and make the following selections:

- Select the MR-J3-T series amplifier.
- Select the MR-J3-D01 expansion card (“option unit”).

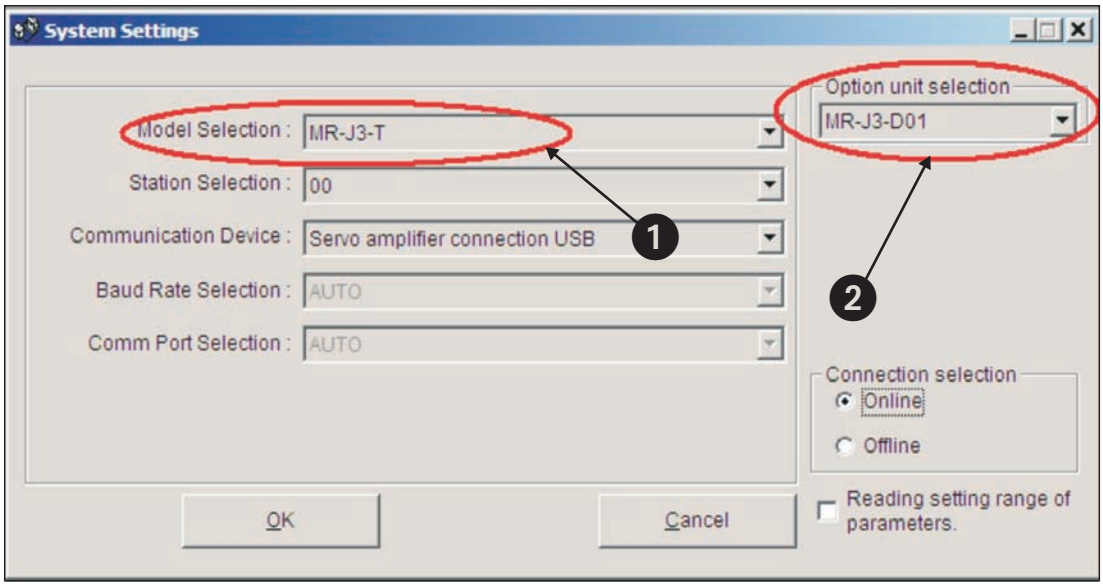


Fig. 4-20: *Settings in MR Configurator for checking the MR-J3-T with the MR-J3-D01 expansion card*

After this you can monitor the signals of the expansion card with the option *Option unit I/F display* in the *Monitor* menu.

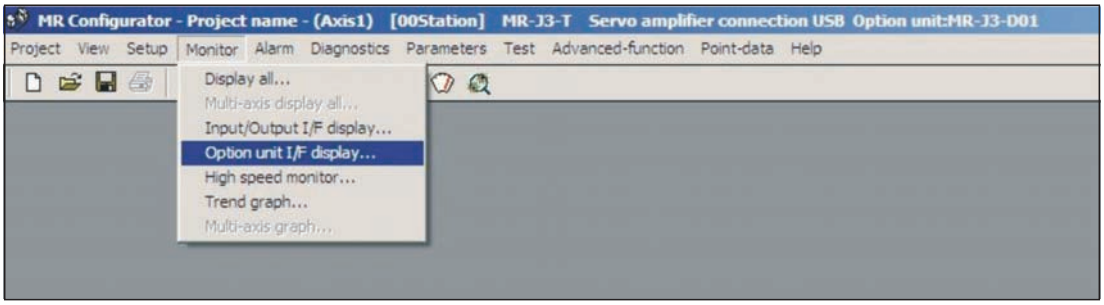


Fig. 4-21: *Selection of the “Option unit I/F display” terminal monitor option*

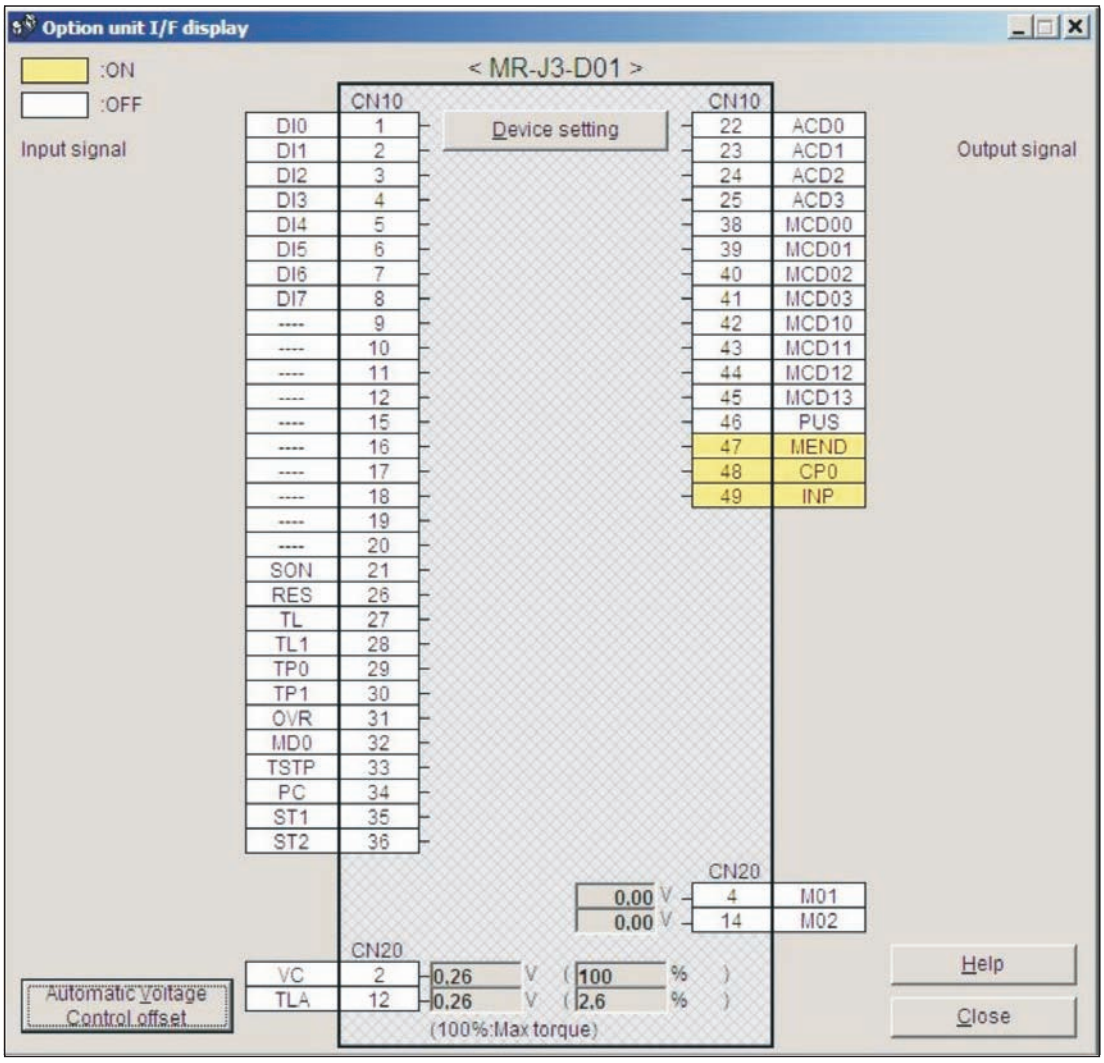


Fig. 4-22: *The "Option unit I/F display" terminal monitoring window*

5 Positioning via a CC-Link Network

As an alternative to using digital signals you can also control positioning with MR-J3-T servo amplifiers via a CC-Link network connection.

NOTE Before proceeding ensure that the MR-J3-D01I/O expansion card is not installed. If it is installed CC-Link communications will be disabled.

5.1 Additional Connections

In addition to the minimum configuration described in chapter 3.1 you also need to connect the CC-Link cable and the cabling for connector CN6 for this mode.

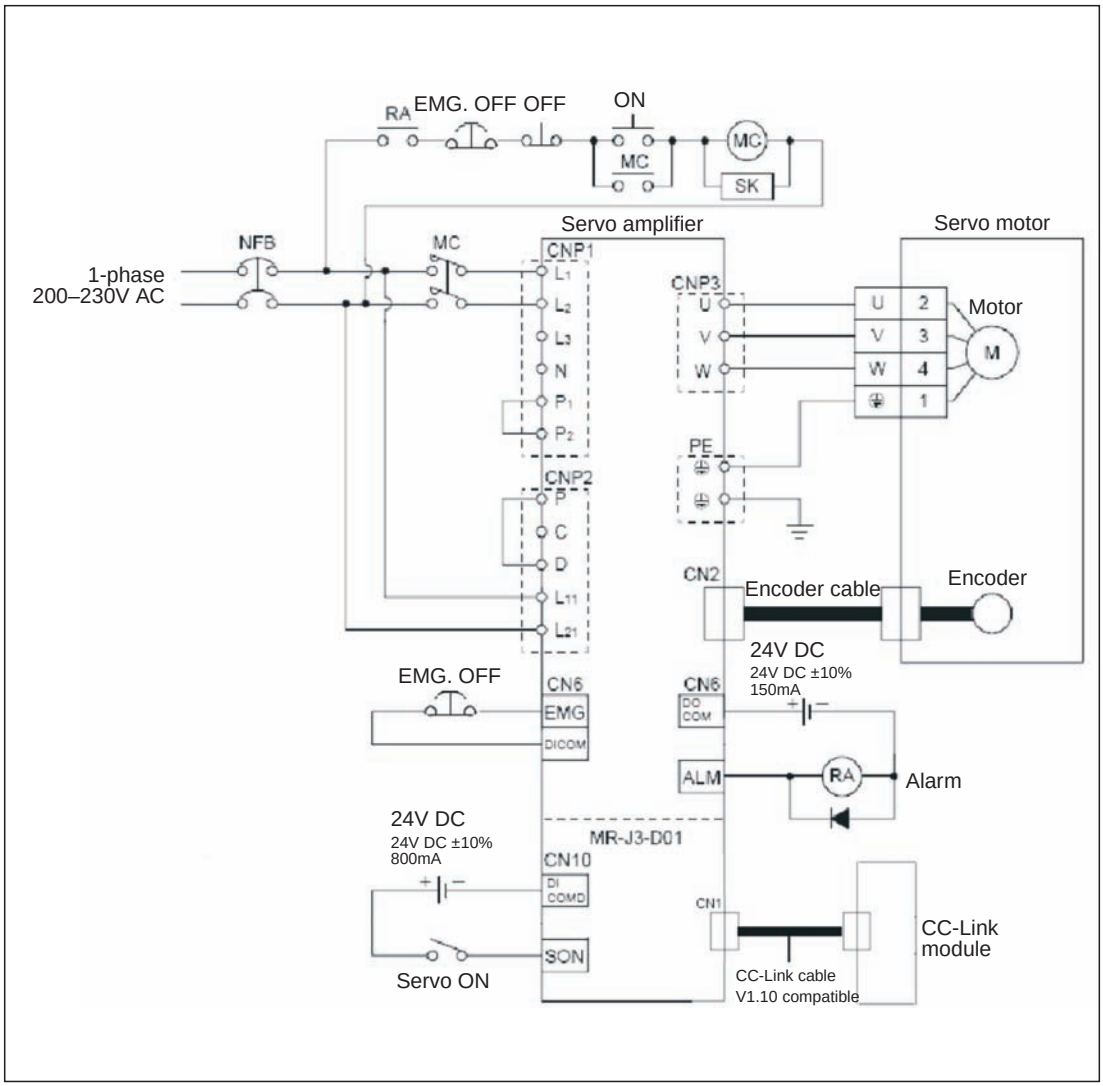


Fig. 5-1: *Connections for operating the servo amplifier via a CC-Link network*

Connections for the CC-Link network

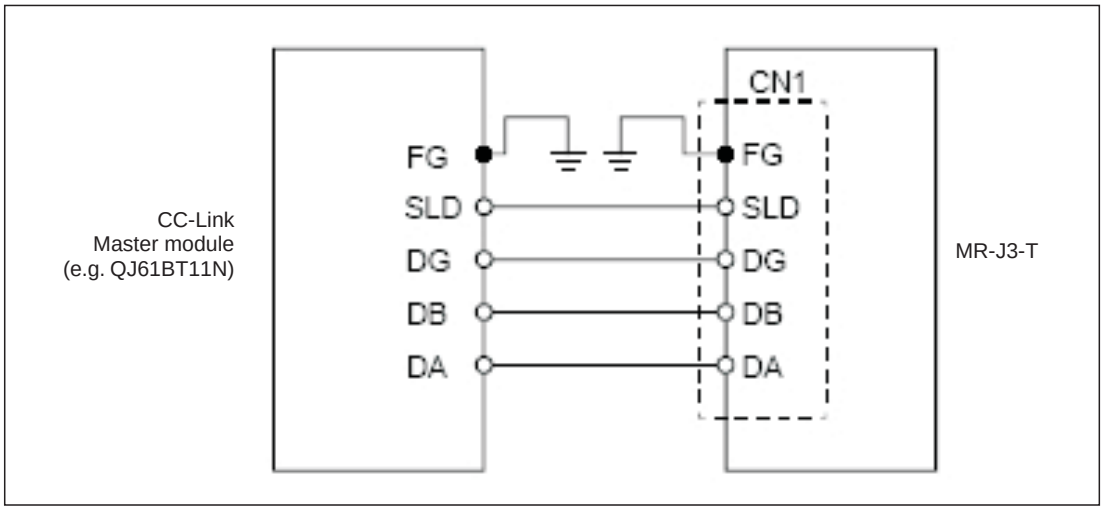


Fig. 5-2: *Connections between the servo amplifier and the CC-Link master module*

NOTE

You must install a terminating resistor on terminals DB and DB on the physical first and last stations in the CC-Link network. The required ohmage of the resistor depends on the cable length, please check the version V1.10 specifications for details.

5.2 CC-Link Communication Settings

5.2.1 Settings on the servo amplifier

In the instructions below we are assuming that you have an operating CC-Link network with the following specifications:

- Data rate 156Kbit/s
- The master station is a QJ61BT11N module that is integrated in a System Q controller platform with a Q02H-CPU.

Procedure:

① Set the number of reserved stations:

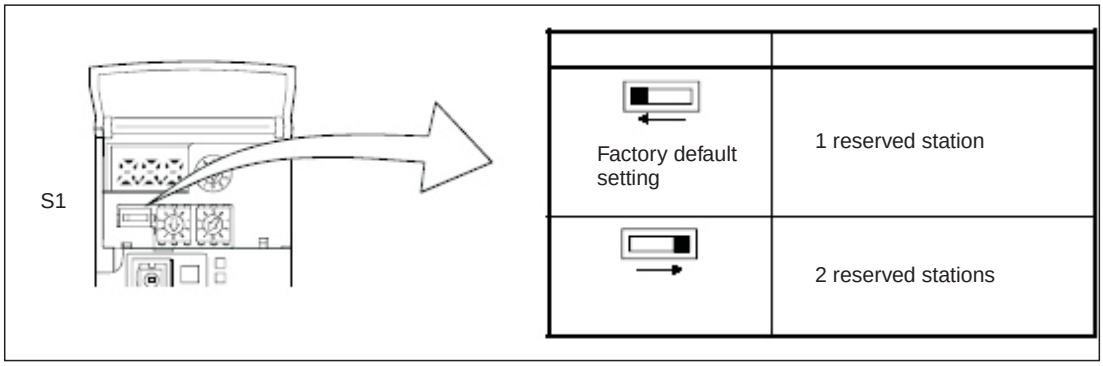


Fig. 5-3: *Correct position of switch S1 for setting the number of reserved stations*

② Set the station address (max. value 64):

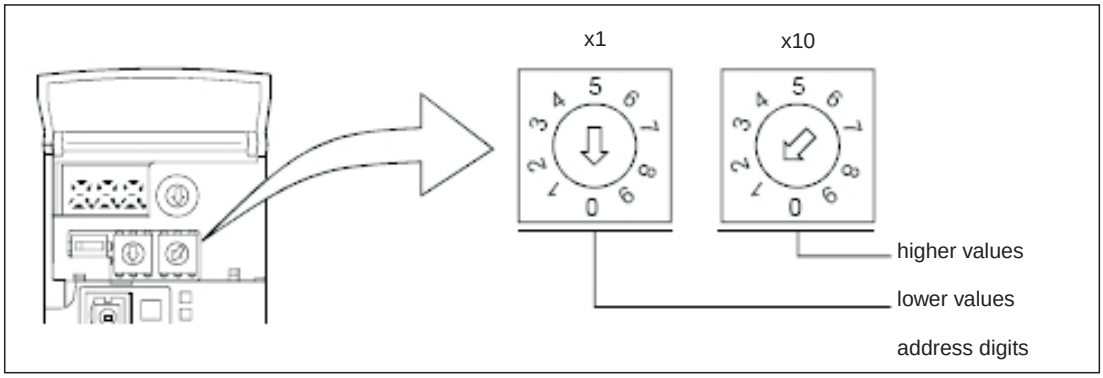
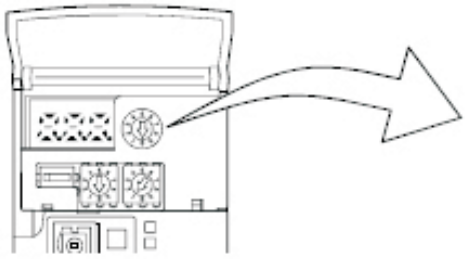


Fig. 5-4: *Set switches x1 and x10 to the correct station address*

③ Set the data rate:



Mode	Baud rate
0	156kbps
1	625kbps
2	2.5Mbps
3	5Mbps
4	10Mbps
5 to 9	-

Fig. 5-5: *Mode switch setting for the network data rate*

NOTE

The servo amplifier settings required for point table positioning are described in chapters 4.2 through 4.4. Please check that these settings have been made correctly before proceeding.

5.2.2 Configuration for communication with GX IEC Developer

Generally, positioning control is performed via a CC-Link network in applications where an additional PLC system is used for automation tasks as well as the integrated controller in the amplifier. In this example we will thus only provide detailed descriptions of the settings required to integrate the servo amplifier in your project.

Procedure:

How to open an existing project in GX IEC Developer:

① Select *Network* ❶ in the project directory tree in the left window.
② Select *CC-Link* ❷ in the *Network Parameter* box.
③ This opens the window *Network parameters: Setting the CC-Link list* where you can now enter the settings shown in Fig. 5-6 ❸.

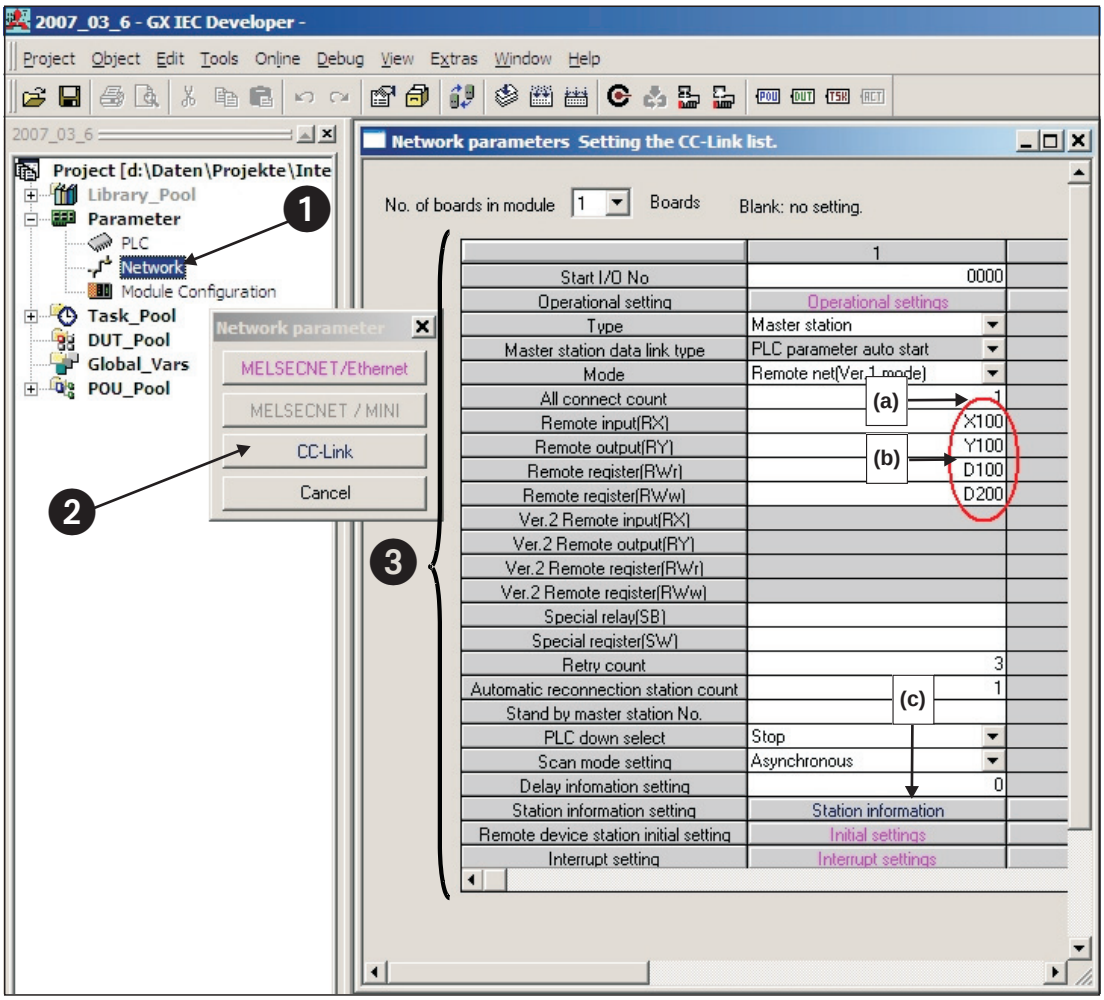


Fig. 5-6: *Settings required in GX IEC Developer for CC-Link communication between the controller and the servo amplifier*

Notes on the network settings:

(a) In the example only one servo amplifier is connected to the CC-Link network. This value must be increased by the number of slave stations installed if applicable.

(b) These values specify which bits or data words are to be used to control the servo amplifier. The settings shown in the example are for the following assignments:

PLC -> Servo Amplifier			Servo Amplifier -> PLC		
PLC I/Os	**Registers**	**Signals**	**PLC I/Os**	**Registers**	**Signals**
Y100	RYn0	SON	X100	RXn0	RD
Y101	RYn1	ST1	X101	RXn1	INP
Y102	RYn2	ST2	X103	RXn3	ZP
Y103	RYn3	DOG	X11A	RX(n+1)A	ALM
Y104	RYn4	LSP			
Y105	RYn5	LSN	NOTE: Signals DI5, DI6 and DI7 are only available when the amplifier is configured to occupy 2 stations in the network.		
Y106	RYn6	MD0			
Y10A	RYnA	DI0			
Y10B	RYnB	DI1			
Y10C	RYnC	DI2			
Y10D	RYnD	DI3			
Y10E	RYnE	DI4			
Y10F	RYnF	RES			

Table 5-1: *Signal assignments*

(c) Slave station type setting:

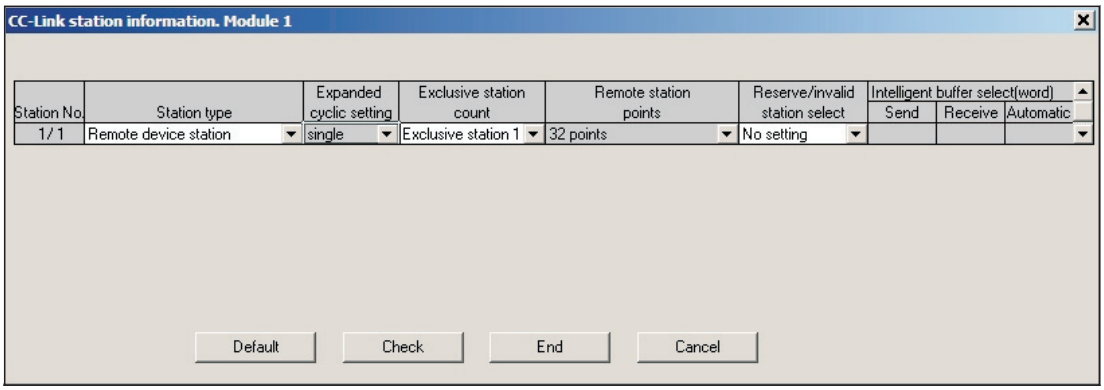


Fig. 5-7: *This configuration also enables exchange of data words*

④ Connect the PC to the PLC and transfer the modified project to the controller.

NOTE

If the CC-Link connection to the servo amplifier is established successfully the **L.RUN**, **SD** und **RD** status LEDs on the servo amplifier will light up.

5.3 Testing the Servo Amplifier via CC-Link

Before proceeding it is a good idea use the monitoring function in GX IEX Developer to check that the individual servo functions can be started correctly (e.g. return to home, positioning). After this you can then test the correct operation of the servo system with the PLC program.

Procedure:

① Activate monitoring mode.
② Select *Entry Data Monitor* in the *Online* menu.
③ Enter the individual remote I/Os to be set or monitored.

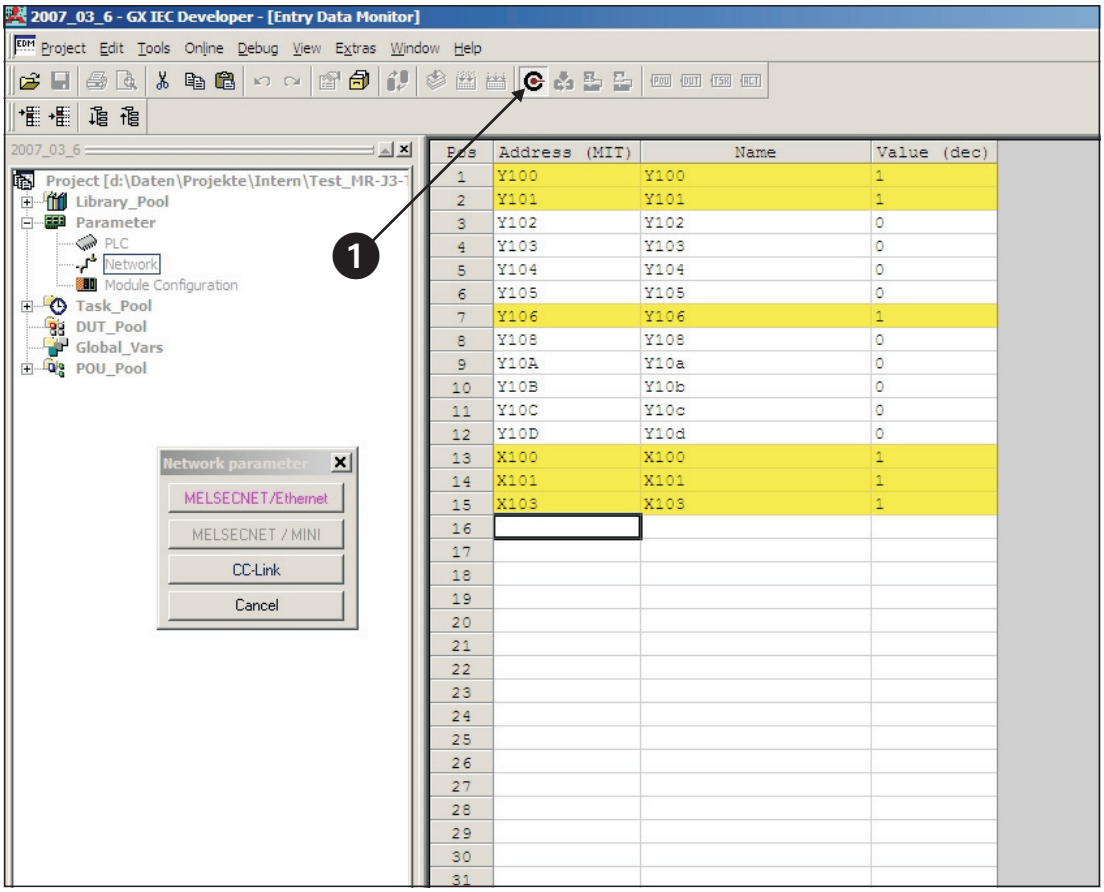


Fig. 5-8: *The Entry Data Monitor window where you can set remote I/Os to test the servo functions*

A Appendix

A.1 Digital Signals – Quick Reference

Connector Pins	Signal Codes		Description	DI / DO
	DI/DO	CC-Link		
CN6-1	EMG	–	Forced stop - emergency safety signal: The signal is permanently assigned to this pin and must be activated for motor control.	DI
CN6-2	DOG	RYn3	Proximity dog switch: This signal is used for some of the home position return modes. (See chapter 4.3)	DI
CN6-3	LSP	RYn4	Forward rotation stroke end switch	DI
CN6-4	LSN	RYn5	Reverse rotation stroke end switch	DI
CN6-14	RD	RXn0	Servo amplifier ready	DO
CN6-15	ALM	RX(n+1)A	Alarm, signals a servo error	DO
CN6-16	ZP	RXn3	Home position return completed successfully	DO
CN10-1	DI0	RYnA	Select point table entry, i.e. activate a line in the table for positioning. Combinations of signals DI0 through DI7 (see Table 4-3) can be used to selec up tot 256 positioning steps. **NOTE:** Signals DI5, DI6 and DI7 are only available when the amplifier occupies 2 stations in the network, thus making 64 bits available via CC-Link.	DI
	Point table entry no.1			
CN10-2	DI1	RYnB		DI
	Point table entry no. 2			
CN10-3	DI2	RYnC		DI
	Point table entry no. 3			
CN10-4	DI3	RYnD		DI
	Point table entry no. 4			
CN10-5	DI4	RYnE		DI
	Point table entry no. 5			
CN10-6	DI5	RY(n+2)3		DI
	Point table entry no. 6			
CN10-7	DI6	RY(n+2)4		DI
	Point table entry no. 7			
CN10-8	DI7	RY(n+2)5		DI
	Point table entry no. 8			
CN10-13	DICOM	–	Connection for an external power supply for the digital control terminals. Negative connection for source interface logic (PNP).	DI
CN10-14				
CN10-21	SON	RYn0	SERVO ON: Activating the SON signal powers on the base circuit and makes the amplifier ready for operation.	DI
CN10-22	ACD0	–	Digital output signals for encoded error messages (see Appendix A.3)	DO
CN10-23	ACD1	–		
CN10-24	ACD2	–		
CN10-25	ACD3	–		
CN10-26	RES	RY1A	Reset for error messages	DI
CN10-32	MD0	RYn6	Switch between automatic/manual mode: The MD0 signal must be off for opertion in jog mode. The signal must be activated before starting a home position return or positioning.	DI
CN10-35	ST1	RYn1	Start signal for forward rotation	DI
CN10-36	ST2	RYn2	Start signal for reverse rotation	DI
CN10-37	DOCO	–	Connection for an external power supply for the digital control terminals. Positive connection for source interface logic (PNP).	DI
CN10-49	INP	RXn1	IN Position: Target position reached signal.	DO

Table A-1: *Digital signals - quick reference*

A.2 Standard Parameters – Quick Reference

<table>
<tr><th>No.</th><th>Code</th><th>Function</th><th>Description</th></tr>
<tr><td>PA01 ①</td><td>*STY</td><td>Positioning control mode</td><td>0: Absolute value command system for target positions
1: Incremental value command system for target positions</td></tr>
<tr><td>PA03 ①</td><td>*ABS</td><td>Absolute position detection system</td><td>0: Incremental system (absolute position detection off)
1: Absolute position detection system on</td></tr>
<tr><td>PA05 ①</td><td>*FTY</td><td>Feed length multiplication factor</td><td>Needed here to scale the home position value to the physical co-ordinate system when a home position offset (shift) has been set.
<table>
<tr><th>Parameter value</th><th>Multiplication factor STM</th><th>Range of the target position values</th></tr>
<tr><td>0</td><td>1</td><td>–999.999 ... +999.999</td></tr>
<tr><td>1</td><td>10</td><td>–9999.99 ... +9999.99</td></tr>
<tr><td>2</td><td>100</td><td>–99999.9 ... +99999.9</td></tr>
</table></td></tr>
<tr><td>PA14 ①</td><td>*POL</td><td>Servo motor rotation direction</td><td>Motor rotation direction (looking at shaft end facing motor):
0: Anticlockwise when ST1 signal is active
1: Clockwise when ST1 signal is active</td></tr>
<tr><td>PC02 ①</td><td>*ZTY</td><td>Home position return mode</td><td>Selects mode to be used for home position return:
0: Proximity dog mode</td></tr>
<tr><td>PC03 ①</td><td>*ZDIR</td><td>Home position return direction</td><td>0: Incrementing counting of encoder pulses
1: Decrementing counting of encoder pulses</td></tr>
<tr><td>PC04</td><td>ZRF</td><td>Home position return speed</td><td>Sets home position return speed until first detection of the Z-phase in [rpm].</td></tr>
<tr><td>PC05</td><td>CRF</td><td>Creep speed</td><td>Speed for precise movement to home position in [rpm]</td></tr>
<tr><td>PC06</td><td>ZST</td><td>Home position offset (shift)</td><td>Distance between the encoder home position (Z-phase) and the physical home position in [µm]. Does not change the zero point of the physical coordinate system.</td></tr>
<tr><td>PC07 ①</td><td>*ZPS</td><td>Home position return position value</td><td>The home position return stops when the Z-phase position is reached.You can enter a non-zero coordinate for this position [in 10^{STM}µm] with this parameter.</td></tr>
<tr><td>PD01 ①</td><td>*DIA1</td><td>Automatic activation of input signals</td><td>This parameter configures the amplifier to automatically set the digital signals internally to a logical "1" when the power is switched on.</td></tr>
<tr><td>PD01 ①</td><td>*DIAB</td><td>Polarity of the input signal</td><td>Logical value for detection of the proximity dog signal (DOG):
0: Active DOG on logical "0"
1: Active DOG on logical "1"</td></tr>
</table>

Table A-2: *Standard parameters – quick reference*

① To activate this parameter you must switch the amplifier power off and on again.

A.3 Alarms and Warning Messages

	Display	Alarm Code④				Error	Alarm Reset		
		ACD3 (Bit 3)	ACD2 (Bit 2)	ACD1 (Bit 1)	ACD0 (Bit 0)		Power Supply OFF → ON	MR-Configurator/ HMI ③	Reset (RES) ②
Alarme	A10	0	0	1	0	Undervoltage	✔	✔	✔
	A12	0	0	0	0	Memory error 1	✔	—	—
	A13	0	0	0	0	Clock error	✔	—	—
	A15	0	0	0	0	Memory error 2 (E^2PROM)	✔	—	—
	A16	0	1	1	0	Encoder error 1 (at power on)	✔	—	—
	A17	0	0	0	0	Board error	✔	—	—
	A19	0	0	0	0	Memory error 2 (Flash ROM)	✔	—	—
	A1A	0	1	1	0	Incorrect servo motor	✔	—	—
	A20	0	1	1	0	Encoder error 2	✔	—	—
	A24	1	1	0	0	Main circuit error	✔	✔	✔
	A25	1	1	1	0	Absolute position lost/erased	✔	—	—
	A30	0	0	0	1	Regenerative braking overload	✔①	✔①	✔①
	A31	0	1	0	1	Overspeed	✔	✔	✔
	A32	0	1	0	0	Overcurrent	✔	—	—
	A33	1	0	0	1	Overvoltage	✔	✔	✔
	A35	1	1	0	1	Input frequency too high	✔	—	—
	A37	1	0	0	0	Parameter error	✔	—	—
	A45	0	0	1	1	Main circuit overheat	✔①	✔①	✔①
	A46	0	0	1	1	Servo motor overheat	✔①	✔①	✔①
	A47	0	0	1	1	Cooling fan error	✔	—	—
	A50	0	0	1	1	Overload 1	✔①	✔①	✔①
	A51	0	0	1	1	Overload 2	✔①	✔①	✔①

Table A-3: *Error messages(1)*

	Display	Alarm Code④				Error	Alarm Reset		
		ACD3 (Bit 3)	ACD2 (Bit 2)	ACD1 (Bit 1)	ACD0 (Bit 0)		Power Supply OFF → ON	MR-Configurator/ HMI ③	Reset (RES) ②
Alarms	A52	0	1	0	1	Excessive discrepancy error	✔	✔	✔
	A61	0	1	0	1	Operation alarm	✔	✔	✔
	A8A	0	0	0	0	Serial communication timeout	✔	✔	✔
	A8E	0	0	0	0	Serial communication error	✔	✔	✔
	888	0	—	—	—	Watchdog	✔	—	—

Table A-3: *Error messages (2)*

① Locate and correct the cause of the error and allow the servo amplifier, the servo motor and the regenerative braking unit to cool down for at least 30 minutes before resetting the alarm and restarting the system for normal operation.

② Switch on the RES signal.

③ To reset the alarm click on the Alarm Reset button in the alarm display window in MR Configurator. You can also reset the alarm by pressing the STOP/RESET button on the HMI control unit.

④ 0: OFF
1: ON

NOTE The output signal ALM is activated when an error or alarm signal is triggered.

	Display	Warning
Warning messages	A90	Home position return incomplete
	A92	Battery cable disconnected
	A96	Home position return error
	A98	Software limit warning
	A99	Stroke limit warning
	A9A	Option unit input data error
	A9F	Battery warning
	AE0	Regenerative system overload warning
	AE1	Overload warning 1
	AE3	Absolute position counter error
	AE6	Server emergency off warning
	AE8	Cooling fan too slow
	AE9	Main circuit off
	AEC	Overload warning 2
	AED	Output wattage exceeded

Table A-4:
Warning messages

NOTE Please see the instruction manual for more detailed descriptions of the alarm messages and warnings.

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